

# **COMBINATION MODEL FOR RURAL-URBAN FRINGE AREA**

(市街地・非市街地フリンジ地域のための組み合わせモデル)

2013年9月

埼玉大学大学院理工学研究科 (博士後期課程)

理工学専攻 (主指導教員 久保田 尚)

**Imma Widyawati Agustin**

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by  
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A dissertation submitted in partial fulfillment of the requirements for the degree  
of Doctor of Philosophy in  
Civil and Environmental Engineering of the  
Graduate School of Science and Engineering of the  
Saitama University, Japan

Committee: Prof. Hisashi Kubota (Chair)  
Prof. Yoichi Kubota  
Prof. Heiji Kawakami  
Assoc. Prof. Fukahori Kiyotaka

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Approved by

A handwritten signature in black ink, appearing to read 'Hisashi Kubota', with a long horizontal stroke extending to the right.

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Prof. Hisashi Kubota

2013

## ABSTRACT

The rural-urban fringe area is the most important area in the city because if city center is insufficient, the target of urban development will move to the rural-urban fringe area. Many urban populations prefer to live in the rural-urban fringe area, as well as housing developers to build housing there due to high demand. This is caused by several things, such as land is cheaper, there is less traffic congestion and pollution, there is easier access and a better road infrastructure, and there is a more pleasant environment with more open space. Many developers are competing with construction in the rural urban fringe area because they want to use the land in the region for several purposes, such as housing developments as urban sprawl continue, science and business parks, hyper-markets and superstores, office developments, hotels and conference centers. If urban development in the area of rural-urban fringe continues to be left uncontrolled, it would be dangerous for the survival of rural-urban fringe area. Because it will cause some problems in the rural-urban fringe area such as large area of the rural-urban fringe maybe lost, buildings maybe out of character with existing rural buildings, villages become sub urbanized, traffic is likely to increase, there may be some noise or pollution. In fact, it is difficult to trace boundaries of rural-urban fringe area clearly because of mixing of urban and provincial properties in an area once. This research investigates this problem by comparing result of three models using GIS function.

The main purpose of this research is to improve the policy of rural-urban planning related to urban development in the rural-urban fringe area. Thus, the objective is divided into several goals, namely: to examine the location of rural-urban fringe area based on combination model; to identify physical change of rural-urban fringe area; to identify the characteristics change of rural-urban fringe area, and to examine an appropriate strategy to anticipate urban development in the rural-urban fringe area. Several approaches are employed, i.e. by comparing result and interpretation of three models (urban-rural land use model, spatial structure model, and combination model) with the same data using GIS function; by comparing result of questionnaire using statistic analysis and overlapping land-use map before and after the construction of fringe-settlements using GIS function; by analyzing the pattern of rural-urban fringe area developments, using exploratory descriptive, statistic descriptive, and population morphology methods; by using SWOT matrix and SWOT analysis.

This research mainly focuses on the location of rural-urban fringe area and city centre in Indonesia, which the location of rural-urban fringe and city centre in the City of Malang has been chosen as the case study. Several primary and secondary data sets are employed, i.e. primary data set of rural-urban fringe area location was observed in September 2009 and continued in July 2010, data set of farmer and come-in population in July 2010. Secondary data set of land conversion in September 2009, land-use policy related to agricultural land conversion from Public Works Department, land use map from National Land Department, village district monographs from village district office, and other data obtained from city government office.

This research is used combination model to identify rural-urban fringe area location. In combination model, the location of rural-urban fringe area is determined by the proportion of

urban land-use functions, residential properties and the proportion of agricultural land-use. It was also calculated based on the distance bands. Related to physical, social, cultural, and characteristic change of rural urban fringe, this research is used a combination of quantitative methods with qualitative methods. Quantitative method is used to determine whether there are physical, social, cultural and characteristic change resulting from the development of fringe-settlements in the rural-urban fringe area, while the qualitative method is used to determine patterns of space utilization and the factors that change the spatial patterns.

The results explain that there are differences in large amounts of rural-urban fringe area in three models. The combination model is an appropriate model to identify rural-urban fringe area location compared with the other two models because the rural-urban fringe area location (inner, outer and urban shadow zone) is more balanced and reasonable than the other two models. The combination model can meet the four requirements related to identification of rural-urban fringe area location. Furthermore, the study results also explain that there has been a physical changes in the rural-urban fringe area caused by the development of fringe-settlements, as follows: Changes in land use are significant, from paddy fields into residential and business; Changes in building area, to be increased breadth because of respondents add their house to be used as a place of business; Changes in function of the building, which was originally home to live into home-business; Changes in condition of neighborhood road, which was originally the dirt road/rock into the asphalt road. As a result of the influence of the development of fringe-settlements, occur specific patterns are: The pattern of changes in land use is star-shaped pattern, influenced by the transportation routes (road) and transport facilities; Neighborhood road pattern is a grid system, is influenced by plots of buildings, land use and building function. Moreover, the characteristic of rural-urban fringe area is changed: There has been a conversion of productive agricultural-land into residential-land; Population growth in the rural-urban fringe area is greater than population growth throughout the city; Calculation of urban sprawl acceleration indicates that urbanization process in the inner fringe area is faster than that in the outer fringe area.

For the establishment of new fringe-settlements should be established in areas that still have a large area especially in the inner fringe, and that is not the area of agriculture. This is because the existence of the fringe-settlements will influence the development of rural-urban fringe area. If the fringe settlements built in the agricultural area especially in the outer fringe, it would have caused many problems especially in terms of land use. Outer fringe area should be keep for agricultural land. So, there is a balance in the rural-urban fringe area between inner fringe and outer fringe. In fact, the development of 'fringe-settlements' gives considerable influence on the physical, social, cultural and characteristic changes in the rural-urban fringe area and the economical society. This proves that the 'fringe-settlements' is the trigger new growth of a city/region. For that reason, there needs to be regulation of the 'fringe-settlements' and home-business especially in Indonesia to being focused and organized.

Thus, hopefully this study will give a new model that can be used by planners to identify and to examine the rural-urban fringe area location and it can provide new inputs for the city government in making policy related to fringe-settlements development. It is important thing for rural-urban planning if we want to make a concept or strategy to anticipate urban or regional developments in the rural-urban fringe area for the next future.

## ACKNOWLEDGEMENTS

I would like to express my feeling of gratefully for My God: ALLAH SWT blessing, love, and guidance along my life. He empowers me to do many things and guide me up to this day.

I would like to express my deepest gratitude and sincere appreciation to my supervisor, Prof. Hisashi Kubota, Department of Civil and Environmental Engineering, Saitama University, for his instructive guidance, excellent advice, constructive criticism, his kindly help, his patience and support throughout the period of my study in Japan.

I would like to express my sincere appreciation to Associate Professor Kunihiro Sakamoto for his outstanding support in many respects.

I would also like to convey my appreciation to Prof. Yoichi Kubota, Prof. Heiji Kawakami, and Associate Professor Kiyotaka Fukahori for their time and kindness to be my dissertation committee members. Their advice and suggestions have improved my dissertation.

I could not disregard to express my feeling of gratitude to Directorate General of Indonesian Higher Education, Department of National Education, Indonesia, the sponsoring institution for me to pursue doctoral degree in Saitama University. Feeling of thankfulness is also expressed to my university, Brawijaya University, which by the hand of Rector, Dean of the Faculty of Engineering, and the Head of Department of Urban and Regional Planning has supported me in many ways up to this time. Support and kindness from my colleagues in the Department of Urban Regional Planning, Brawijaya University, are really meant to me. Appreciation is also expressed to all my students, who support and motivate me in many ways to complete this study.

Many thanks to Ms. Masako Kishimoto for her kind help in administrative and personal matters. My special thanks all my good friends during my stay in Saitama. I also enjoyed and felt of supported by all member of UTG Laboratory, since my first day I arrived in Japan until today.

I would like to extend my deepest sense of gratitude to my lovely father and mother for their unending love, inspiration and blessing. My special feeling of gratitude goes to my brother, my sister, my nephew, my niece, and my big family for their support.

## TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	viii
LIST OF FIGURES	xi
ABBREVIATIONS AND NOTATIONS	xiv
CHAPTER 1 INTRODUCTION	1-1
1.1 Background	1-2
1.2 Research Objective	1-3
1.3 Scope of Research	1-3
1.4 Structure of the Dissertation	1-3
1.5 Research Framework and Analysis Scheme	1-3
1.6 References	1-7
CHAPTER 2 RURAL-URBAN FRINGE	2-1
2.1 Definition of Rural-Urban Fringe	2-1
2.2 Definition of Peri-Urban	2-1
2.3 Environments of the City's Countryside	2-7
2.4 Definition and Characteristics of the City	2-8
2.5 Aspects of City-forming	2-9
2.5.1 Physical aspects	2-9
2.5.2 Social aspects	2-10
2.5.3 Economic aspects	2-10
2.5.4 Transportation aspects	2-10
2.6 City Development	2-11
2.7 The Pattern of City Development	2-11
2.7.1 Concentric development	2-11
2.7.2 Ribbon development	2-12
2.7.3 Leapfrog development	2-13
2.8 The Process and Effects of the Development of Physical Appearance of the City	2-15
2.9 Factors that Influence the Pattern of Physical Development	2-17
2.10 Theory of City Size	2-18
2.11 Administration Delimitation versus Morphology of the City	2-19
2.12 Spatial Differentiation in the Land-use of Cities and Villages	2-19
2.12.1 Morphology of cities by Robin Pryor	2-20
2.12.2 Morphology of cities by Russwurm	2-21
2.12.3 Morphology of cities by Yunus	2-22
2.13 Characteristics of Rural-Urban Fringe Based on Morphology of Cities Approach	2-23
2.14 Environmental Perspective of Rural-Urban Fringe	2-24
2.15 Land-use Pattern in Rural-Urban Fringe	2-25
2.16 Rural-Urban Fringe Communities	2-26
2.17 The Role of GIS in Spatial	2-28
2.18 Pro and Contra in Growth Management Efforts in Rural-Urban	2-29

	Fringe Area	
2.19	Constraints and Strategies in Rural-Urban Fringe Area Development	2-30
2.20	Rural-Urban Fringe Area Development Concepts	2-30
	2.20.1 Urban oriented technique	2-31
	2.20.2 Rural oriented technique	2-33
2.21	Settlements, Real Estate, and Real Property	2-35
	2.21.1 The house as primary needs for human.	2-35
	2.21.2 The Provision of housing development	2-36
	2.21.3 Factors that affect property values	2-36
2.22	City Centre	2-37
2.23	References	2-39
<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	<b>3-1</b>
3.1	Type of Research	3-1
3.2	Variable	3-2
3.3	Materials of Research	3-3
3.4.	Study Approach	3-3
	3.4.1 Physical morphological approach	3-3
	3.4.2 Behavior approach	3-3
3.5	Research Framework	3-3
3.6	Data Collection	3-7
	3.6.1 Determining of population and sample	3-7
	3.6.2 Research tools	3-8
	3.6.4 Source of data collection	3-8
3.7	Analysis	3-9
	3.7.1 Qualitative analysis	3-9
	3.7.2 Quantitative analysis	3-11
	3.7.3 Analysis of development	3-14
3.8	References	3-15
<b>CHAPTER 4</b>	<b>AN APPROPRIATE MODEL TO IDENTIFY LOCATION OF RURAL-URBAN FRINGE AREA</b>	
4.1	Introduction	4-1
4.2	Land Use and Rural-Urban Fringe	4-2
	4.2.1 Urban-Rural Land Use Model by Yunus	4-3
	4.2.1 Spatial Structure Model by Russwurm	4-4
4.3	Study Area	4-5
4.4	Combination Model	4-6
4.5	Research Method	4-7
4.6	Determining The Location of Rural-Urban Fringe Area	4-9
	4.6.1 Urban-Rural Land Use	4-9
	4.6.2 Spatial Structure	4-11
	4.6.3 Combination	4-13
4.7	Comparative Analysis	4-15
4.8	Discussion and Conclusion	4-18
4.9	References	4-21
<b>CHAPTER 5</b>	<b>THE INFLUENCE OF FRINGE -SETTLEMENTS TO PHYSICAL CHANGE IN RURAL-URBAN FRINGE AREA</b>	

5.1	Introduction	5-1
5.2	Settlements, Real Estate and Real Property in Indonesia	5-2
5.2.1	The house as primary needs for human	5-2
5.2.2	The Provision of Housing Development	5-2
5.3	Factors that Affect Property Values	5-3
5.4	Land-use and Rural-Urban Fringe Area	5-3
5.5	Research Method	5-4
5.5.1	Study area	5-5
5.5.2	Data collection	5-7
5.5.3	Questionnaire	5-8
5.6	Physical Change	5-9
5.6.1	Land-use Changes	5-9
5.6.2	Built-up Changes	5-14
5.6.2.1	Building area	5-14
5.6.2.2	Function of building	5-17
5.6.2.3	Shape of building	5-22
5.6.2.4	Layout of building	5-24
5.6.3	Infrastructure of RUF	5-25
5.6.4	Utilities and Home Environment of RUF	5-27
5.6.4.1	Source of water	5-27
5.6.4.2	Waste service	5-29
5.6.4.3	Environmental of health	5-31
5.6.4.4	Electricity demand	5-33
5.6.5	Recapitulation of Physical Change in the Rural-Urban Fringe Area	5-35
5.6.6	The Pattern of development of the region of space in rural-urban fringe area because of the development of fringe-settlements	5-36
5.6.7	Discussion and Conclusion	5-42
5.8	References	5-43

## CHAPTER 6 AN APPROPRIATE STRATEGY TO ANTICIPATE URBAN DEVELOPMENT IN RURAL-URBAN FRINGE AREA

6.1	Introduction	6-1
6.2	Land Use and Rural-Urban Fringe	6-2
6.3	The Role of GIS in Spatial	6-2
6.4	Research Method	6-3
6.4.1	Approach	6-3
6.4.2	Analysis of population growth	6-6
6.4.3	Analysis of agricultural-land reduction	6-6
6.4.4	Analysis of residential-land	6-7
6.4.5	Analysis of additional of non-agriculture land and residential-land	6-7
6.4.6	Analysis of acceleration of urban sprawl	6-7
6.4.7	Analysis of SWOT	6-8
6.5	Study Area	6-8
6.6	Data Collection	6-8
6.2.1	Questionnaire	6-9
6.2.1	Method of survey	6-10
6.2.1	Descriptive statistic	6-10

6.7	Rural-Urban Fringe Area Location Based on Combination Model	6-11
6.8	The Pattern of Regional Development	6-13
6.8.1	The pattern of population growth	6-13
6.8.2	The pattern of building	6-14
6.8.3	The pattern of agricultural-land reduction	6-14
6.8.4	The pattern of additional of residential-land	6-14
6.8.5	The pattern of additional of non-agriculture land and residential-land	6-16
6.8.6	The pattern of acceleration of urban sprawl	6-16
6.9.	The Process of Regional Development	6-16
6.9.1	Housing acquisition	6-16
6.9.2	Farmer's commitment to their agricultural-land	6-17
6.9.3	Farmer's commitment to their agricultural-activities	6-18
6.10	Recapitulation of Characteristic Changes in the Rural-Urban Fringe Area	6-18
6.11	Strategy of Rural-Urban Fringe Area	6-19
6.12	Conclusion	6-21
6.13	References	6-22
CHAPTER 7	CONCLUSIONS AND SUGGESTION	
7.1	Conclusions	7-1
7.1.1	Location of Rural-Urban Fringe Area	7-1
7.1.2	Physical Change of Rural-Urban Fringe Area	7-2
7.1.3	An Appropriate Strategy for Rural-Urban Fringe Area	7-3
7.2	Suggestions	7-5
PUBLICATION LIST		8-1
PAPER		

## LIST OF TABLES

Table 2.1	The differences between sub-urban and peri-urban	2-6
Table 2.2	Several vendors of GIS software (Shunji Murai, 1999)	2-29
Table 3.1	Research variable	3-1
Table 3.2	Administrative area of study sites	3-7
Table 4.1	Classification of land-use types	4-8
Table 4.2	Identification of rural-urban fringe area based on urban-rural land use model 2010	4-9
Table 4.3	Percentage of land-use types in the rural-urban fringe area based on urban-rural land use model	4-10
Table 4.4	Identification of rural-urban fringe area based on spatial structure model 2010	4-11
Table 4.5	Percentage of land-use types in the rural-urban fringe area based on spatial structure model	4-12
Table 4.6	Identification of rural-urban fringe area based on combination model 2010	4-13
Table 4.7	Percentage of land-use types in the rural-urban fringe area based on combination model	4-14
Table 4.8	Percentage of rural-urban fringe area 2010 by three models	4-15
Table 4.9	Percentage of land-use types changes in the rural-urban fringe area by three models	4-18
Table 4.10	Percentage of land-use types changes in urban fringe area by three models	4-20
Table 4.11	Percentage of land-use types changes in Pandanwangi by three models for 1990, 2000 and 2010	4-20
Table 5.1	Administrative area of study sites	5-5
Table 5.2	General characteristics of respondents (the owners of home-business; n=202)	5-8
Table 5.3	Land use type in the study area around the fringe-settlements	5-10
Table 5.4	Changes of land-use types before and after the construction of the Fringe-settlements in the rural-urban fringe areas	5-10
Table 5.5	Type of land use before 1990* Type of land use in 2010Cross-Tabulation	5-11
Table 5.6	Comparison of state of rural-urban fringe area before and after the construction of the fringe-settlements	5-13
Table 5.7	Type of land use before 1990* Function of the building in 2010* Relationship with the construction of the fringe-settlements Cross-Tabulation	5-14
Table 5.8	Building area occupied before and after the construction of the fringe-settlements in the rural-urban fringe areas	5-14
Table 5.9	Size of building in 1990*Size of building in 2010*Cause of changes/addition of building	5-16
Table 5.10	Functions of the building in the opinion of the respondents	5-17
Table 5.11	The function of building in 1990*The function of building in 2010*Relationship with the construction of the 'fringe-settlements'	5-18
Table 5.12	The total initial investment of home-business owners	5-19
Table 5.13	Respondent's income per month	5-19

Table 5.14	The total initial investment of home-business owners* Respondent's income per month Cross-Tabulation	5-20
Table 5.15	Main income per month* Second income per month* Kind of the main job	5-21
Table 5.16	Shape of the building in the opinion of the respondents	5-23
Table 5.17	Condition of shape of the building in 1990*Condition of shape of the building in 2010Cross-Tabulation	5-23
Table 5.18	Layout of the building in the opinion of the respondents	5-24
Table 5.19	Changes/addition of the building in 2010*Cause/reason of changes/additions of the building*Layout of the building in 2010	5-25
Table 5.20	Condition of neighborhood road in the opinion of the respondents	5-26
Table 5.21	Source of water in the opinion of the respondents	5-28
Table 5.22	Source of water in 1990* Source of water in 2010Cross-Tabulation	5-28
Table 5.23	Source of water in 1990* Source of water in 2010* Function of the building in 2010 Cross-Tabulation	5-29
Table 5.24	Condition of waste service in the opinion of the respondents	5-30
Table 5.25	Condition of waste services in 1990* Condition of waste services in 2010Cross-Tabulation	5-31
Table 5.26	Condition of waste services in 1990*Condition of waste services in 2010*Layout of the building in 2010	5-31
Table 5.27	Level of environmental health in the opinion of the respondents	5-32
Table 5.28	Level of environmental health in 2010*Condition of waste service in 2010*Source of water in 2010	5-33
Table 5.29	Level of demand for electricity in the opinion of the respondents	5-33
Table 5.30	Function of the building in 1990*Function of the building in 2010*Electric power needs in 2010	5-35
Table 5.31	Recapitulation of the influence of fringe-settlements to physical change in the rural-urban fringe area in the opinion of the respondents	5-35
Table 5.32	Recapitulation of the pattern in the rural-urban fringe area	5-41
Table 6.1	Classification of land-use types	6-3
Table 6.2	General characteristics of respondents (farmer; n=184)	6-10
Table 6.3	General characteristics of respondents (come-in population; n=184)	6-11
Table 6.4	Percentage of rural-urban fringe area 2010 by comparison of three models	6-11
Table 6.5	The percentage of land-use types changes in rural-urban fringe area by three models	6-12
Table 6.6	Percentage of land-use types changes in Pandanwangi by three models for 1990, 2000 and 2010	6-15
Table 6.7	The development of population in the rural-urban fringe area	6-13
Table 6.8	The development of come-in population in the rural-urban fringe area	6-13
Table 6.9	The development of farmer in the rural-urban fringe area	6-14
Table 6.10	Agricultural-land reduction in the rural-urban fringe area	6-14
Table 6.11	Additional of residential-land in the rural-urban fringe area	6-14
Table 6.12	Additional of non-agriculture land and residential-land in rural-urban fringe area	6-16
Table 6.13	Acceleration of urban sprawl index	6-16
Table 6.14	Housing acquisition in the rural-urban fringe area	6-17
Table 6.15	Farmer's commitment to their agricultural-land	6-17
Table 6.16	Farmer's commitment to their agricultural-land* Income distribution of farmer	6-17

Table 6.17	Farmer's commitment to their agricultural-activities	6-18
Table 6.18	Farmer's commitment to their agricultural-activities* Income distribution of farmer	6-18
Table 6.19	Recapitulation of characteristic changes in the rural-urban fringe area in the opinion of the respondents	6-19
Table 6.20	SWOT matrix of rural-urban fringe area in study area	6-24

## LIST OF FIGURES

Figure 2.1	The peri-urban components ( <a href="http://www.netssaftutorial.com/Differentiating-between-peri-u.499.0.html">http://www.netssaftutorial.com/Differentiating-between-peri-u.499.0.html</a> )	2-2
Figure 2.2	Rural components ( <a href="http://www.netssaftutorial.com/Differentiating-between-peri-u.499.0.html">http://www.netssaftutorial.com/Differentiating-between-peri-u.499.0.html</a> )	2-2
Figure 2.3	Concept of formation of PU areas (Thirumurthy, 2005)	2-3
Figure 2.4	Rural-urban flow (Thirumurthy, 2005)	2-5
Figure 2.5	Position of urban agglomerations (Boustedt, 1975)	2-6
Figure 2.6	Position of the sub-urban and the peri-urban (David L. Iaquina and Axel W. Drescher, 2000)	2-7
Figure 2.7	Intersection of environments in the city's countryside (Bryan, Russwurm, and McLellan, 1982:19)	2-8
Figure 2.8	Concentric Development Model (Northam, 1971; Yunus, 1994)	2-12
Figure 2.9	Ribbon Development Model (Northam, 1971; Yunus, 1994)	2-12
Figure 2.10	Leapfrog Development Model (Northam, 1971; Yunus, 1994)	2-13
Figure 2.11	Physical Propagation Model of the City (Northam, 1971; Yunus, 1994)	2-14
Figure 2.12	Six Patterns of Physical Development of Cities According to Branch (1995)	2-15
Figure 2.13	Expansion-diffusion and Relocation-diffusion Model (Hagget, 1970)	2-15
Figure 2.14	Rural-urban land use triangle model (Pryor, 1968)	2-20
Figure 2.15	Spatial structure model (Russwurm, 1975)	2-22
Figure 2.16	Urban-rural land use model (Yunus, 2000)	2-23
Figure 2.17	Rural-urban land use triangle (Pryor, 1968)	2-26
Figure 2.18	Components of GIS Hardware System (Shunji Murai, 1999)	2-29
Figure 3.1	Interactive model of qualitative data analysis (Miles and Huberman, 1992: 15-20)	3-12
Figure 3.2	SWOT Analysis Matrix (Nugroho, 2002)	3-17
Figure 4.1	Rural-urban land use triangle model (Pryor, 1968)	4-3
Figure 4.2	Urban-rural land use model (Yunus, 2000)	4-4
Figure 4.3	Spatial structure model (Russwurm, 1975)	4-5
Figure 4.4	The location of study area and the study area showing the four sub-districts and their boundaries	4-5
Figure 4.5	Digital elevation model of the study area	4-6
Figure 4.6	Combination model (Agustin and Kubota, 2010)	4-6
Figure 4.7	Land-use types in 1990 to 2010	4-7
Figure 4.8	Observation cells in study area 2010	4-9
Figure 4.9	Rural-urban fringe area based on urban-rural land use model in 2010. Inner fringe: ■, Outer fringe: ■, Urban shadow zone: ■, Urban area: ■	4-10
Figure 4.10	The pattern of land-use types in rural-urban fringe area based on urban-rural land use model 1990 (a), 2000 (b), and 2010 (c).	4-11
Figure 4.11	Rural-urban fringe area based on spatial structure model 2010. 1: Core, 2: Inner fringe, 3: Outer fringe, 4: Urban shadow zone	4-12
Figure 4.12	The pattern of land-use types in rural-urban fringe area based on spatial structure model 1990 (a), 2000 (b), and 2010 (c).	4-13
Figure 4.13	Rural-urban fringe area based on combination model in 2010. Inner fringe: ■, Outer fringe: ■, Urban area: ■	4-14

Figure 4.14	The pattern of land-use types in rural-urban fringe area based on combination model 1990 (a), 2000 (b), and 2010 (c)	4-15
Figure 4.15	Rural-urban fringe area based on combination model (a), urban-rural land use model (b), and spatial structure model (c)	4-16
Figure 4.16	Land-use types changes in urban fringe area based on combination model (a), based on urban-rural land use model (b), and based on spatial structure model (c).	4-17
Figure 5.1	Combination model	5-4
Figure 5.2	The location of study area and the study area showing the four sub-districts and their boundaries	5-6
Figure 5.3	The digital elevation model of the study area	5-6
Figure 5.4	Fringe-settlements in rural-urban fringe area	5-7
Figure 5.5	Land-use change from paddy field to settlements in the study area	5-11
Figure 5.6	Land-use type in 1990, 2000, and 2010	5-12
Figure 5.7	Asphalt-roads connecting dwellings of rural-urban fringe area with fringe-settlements	5-12
Figure 5.8	Land-use changes in rural-urban fringe area from paddy field into fringe-settlements in 2010	5-13
Figure 5.9	Percentage of 'building area' in 1990 and 2010	5-15
Figure 5.10	Relationship between the total building areas of respondents with a building area which is used as a place of business	5-16
Figure 5.11	Percentage of function of the buildings before and after the construction of the 'fringe settlements' in rural-urban fringe area	5-18
Figure 5.12	Relationship between the total initial investment of home-business owners and respondent's income per month	5-20
Figure 5.13	Home-business of respondent's in rural-urban fringe area(*the function of this building is home-restaurant, close to the fringe-settlements Purwanto Agung)	5.22
Figure 5.14	Percentage of the condition of shape of the building before and after the construction of the 'fringe settlements' in rural-urban fringe area	5-23
Figure 5.15	Percentage of Layout of the building before and after the construction of the 'fringe-settlements' in rural-urban fringe	5-24
Figure 5.16	Percentage of the condition of the neighborhood road in 1990 and in 2010	5-26
Figure 5.17	Condition of the neighborhood road in rural-urban fringe area close to the fringe-settlements 2010	5-27
Figure 5.18	Percentage of the source of water in 1990 and 2010	5-28
Figure 5.19	Percentage of the condition of waste service in 1990 and 2010	5-30
Figure 5.20	Percentage of the level of environmental health in 1990 and 2010	5-32
Figure 5.21	Percentage of the level of demand for electricity in 1990 and in 2010	5-34
Figure 5.22	The pattern of land use changes of the study area in 2010	5-36
Figure 5.23	Form of 'scattered constellation' in Pandanwangi	5-37
Figure 5.24	The relationship between the presence of fringe-settlements, 'home-business' and other facilities in rural-urban fringe area	5-38
Figure 5.25	Home-business in rural-urban fringe area close to the fringe-settlements (*Pondok Blimbing Indah)	5-39
Figure 5.26	Home-business in rural-urban fringe area close to the fringe-settlements (*Pondok Blimbing Indah)	5-39
Figure 5.27	The relationship between the function of buildings in rural-urban fringe area and the distance to the fringe-settlements	5-40

Figure 5.28	The pattern 'layout of buildings' on the other building	5-40
Figure 5.29	The pattern 'layout of commercial buildings' linear on the road	5-41
Figure 6.1	Classifications of land use in 1990 to 2010. 1: dwellings, 2: trade/services, 3: green space, 4: recreation, 5: education, 6: healthiness, 7: office affairs, 8: liturgy, 9: industrial, 10: military, 11: plantation, 12: moor, 13: paddy field, 14: terminal, 15: water reservoir, 16: road/drainage, 17: vacant	6-4
Figure 6.2	Land-use types in 1990 to 2010	6-4
Figure 6.3	Combination model	6-5
Figure 6.4	Observation cells in study area 2010	6-6
Figure 6.5	The location of study area and the study area showing the four sub-districts and their boundaries	6-9
Figure 6.6	Digital elevation model of the study area	6-9
Figure 6.7	Land-use types changes in urban fringe area based on urban-rural land use model (a), based on spatial model (b), and based on combination model (c).	6-12
Figure 6.8	SWOT diagram	6-20
Figure 6.9	Appropriate concept for rural-urban fringe area	6-20

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

There are many studies about land-use changes at the national scale as well as the smaller scale, such as cities or villages (Himiyama, 1994, 1998; Hoshino, 2001; Verbist et al., 2005). These studies have regarded a region as an aggregated system which can be used to estimate only amount of land-use change (Rustiadi and Kitamura, 1998). Braimoh and Onishi (2007) identified the factors responsible for residential and industrial/commercial land development in Lagos. They classified land use into four: (1) Residential, (2) Industrial/commercial, (3) Non-urban, and (4) Water.

Land use as a human activity product on earth's surface shows a large variation, within both local and regional city. An understanding of land use forms that characterize the built-up area, urban-rural transition area, and the countryside itself, is a matter of principle to do its spatial structure differentiation. An understanding of "urban" and "rural" also needs attention -especially "urban" related to urban life and "rural" associated with countryside life. Aspects of life itself consist of urban and countryside aspects: political, social, economic, cultural, psychological, technological, and physical. In discussing this morphological approach, someone insisted on the physical aspect, and one of which is land use. To distinguish between types of urban and rural land use, these kinds of linkages with agricultural land became the main focus because most of the provincial land use type is associated with agricultural activities. Thus appears the term 'urban agricultural land' and 'rural agricultural land'. Lands located in urban areas (morphologically) are used for agricultural purposes, while 'rural agricultural land' has many examples and is common in rural areas. Such land use includes: rice field, dry land, garden mix, etc. Thus, identifying with provincial agricultural or non-urban agricultural is not entirely correct, but linking the proportion of 'urban agricultural land' compared with 'urban non-agricultural land' is small, its presence ignored. Similarly, "rural non-agricultural land" and "rural agricultural land" types dominate land use in rural and urban areas. To dominate land use type in rural and urban, the definition of 'dominance' is used for any discussion of spatial structure in terms of land use type. The main problem lies in the transition area from the appearance of a "real urban" to "real rural" appearance. In this transition area, the domination problem appears to be blurred, especially for regions moving from urban to rural. However, counting of land use type can be achieved with the grid system approach, administrative approach or physical approach. From the calculation of land use area in each cells (grid system approach) or 'areal units' (administrative and physical approach), the percentage of land use orientation can be known and sub-zone of each cell can be determined also (Yunus, 2000, pp. 162-164).

The rural-urban fringe is the landscape located just outside of established cities and towns, where the countryside begins. The fringe characterized by diversity in land uses, with many areas in continuous transition (Friedberger, 2000; Sullivan and Lovell, 2006). Land conversion has both direct and indirect consequences. The direct impacts include loss of prime agricultural-land, loss of agricultural jobs, loss of investment of infrastructure and natural landscape destruction, and excessive exploitation of groundwater (Bryant et al., 1982; Lockeretz, 1989; Firman, 2000). Land conversion in Indonesia has occurred at a large scale.

Hence it could greatly affect the production of foodstuffs, as well as waste investment in irrigation of agricultural-lands, notably the paddy fields. There is no evidence that any country has been able to limit agricultural-land conversion successfully without causing high pressure on land prices for other purposes (Bernstein,1994; Firman, 2000).Attention balanced and proportionate course required in the development of rural-urban fringe area. It is related to the growing land conversion in rural-urban fringe area. Urban development is necessary for the growth of regional and national economy while the character development of provincial resources aimed at saving food and the importance of environmental balance. Then the objective of expansion which rural characteristic is balancing environment. It is difficult to implement this development orientation because of many experts think that in reality the interests of their respective opposites. Thats why many experts emphasized the problems of unmanaged land use controls and high conversion rate in rural-urban fringe areas.

T.L. Smith's (1937) discussion of the "urban fringe" around Louisiana marked the first use of this term, signifying "the built-up area just outside the corporate limits of the city". Kurtz and Eicher (1958) differentiate between "fringe" and "suburb"; Wissink (1962) defines "fringe", "suburbs", "pseudo-suburbs", "satellites" and "pseudo-satellites"; Schnore (1957) distinguishes between "satellites" and "suburbs". A number of writers have described different types of suburbs, some of which could be synonymous with the "fringe" of another research worker. Pryor (1968) calculated the percentage of urban land use, percentage of provincial land use and percentage of distance from the main urban area. The three components are combined in the rural-urban land use triangle model. The creation of this model based on the idea of gradual transformation from city to village or vice versa. The 'distance decay principle', where the further away from the 'real urban' appearance will increasingly blur in the town, also applies here. In contrast, the village became clear appearance. In other words, it can be said that the dominance of urban land use forms will increase if it closes to urban area and vice versa.

Studies of land-use change and rural-urban fringe have been superficial in many regions. It seems that rural-urban fringes neglected because of the difficulties of grasping the spatial relationships between land-use changes and the location of rural-urban fringes.

## **1.2 Research objective**

The main purpose of this research is to improve the policy of rural-urban planning related to urban development in the rural-urban fringe area and to stimulate economic activity through increased pedestrian activity in the city centre when the design of BRO is really implemented. Thus, the objective is divided into several goals, namely:

1. to examine the location of rural-urban fringe area based on combination model
2. to identify the physical changes of rural-urban fringe area
3. to identify the characteristics change of rural-urban fringe area, and
4. to examine an appropriate strategy to anticipate urban development in rural-urban fringe area

Several approaches to achieve the objective and goals are as follows:

1. By comparing result and interpretation of three models (urban-rural land use model, spatial structure model, and combination model) with the same data using GIS function.
2. By comparing result of questionnaire using statistic analysis and overlapping land-use map before and after the construction of fringe-settlements using GIS function.

3. By analyzing the pattern of rural-urban fringe area developments, using exploratory descriptive, statistic descriptive, and population morphology methods.
4. By using SWOT matrix and SWOT analysis.

### **1.3 Scope of research**

This research mainly focuses on the location of rural-urban fringe area and city centre in Indonesia, which the location of rural-urban fringe and city centre in the City of Malang has been chosen as the case study.

Several primary and secondary data sets are employed, i.e. primary data set of rural-urban fringe area location was observed in September 2009 and continued in July 2010, data set of farmer and come-in population in July 2010. Secondary data set of land conversion in September 2009, land-use policy related to agricultural land conversion from Public Works Department, land use map from National Land Department, village district monographs from village district office, and other data obtained from city government office.

### **1.4 Structure of the dissertation**

This dissertation consists of eight chapters. Chapter two highlights the literature review regarding the definition of the rural-urban fringe, location, characteristic, aspects of city-forming, city development, patterns, theory of city size, morphology of city, city centre, land use pattern in the rural-urban fringe, the rural-urban fringe communities, constraints and strategies in the rural-urban fringe, concept of the rural-urban fringe, rural settlement and fringe-settlements, etc.

Chapter three provides the analysis methods used for this research. Chapter four focuses on how to examine the location of the rural-urban fringe area by urban-rural land use model, spatial structure model, and combination model. This chapter also demonstrates that combination model is the most appropriate model to identify location of rural-urban fringe area.

Chapter five describes physical changes of the rural-urban fringe area. Chapter six describes the characteristics change of the rural-urban fringe area. This chapter also explains farmer's commitment to their agricultural-land and their agricultural activities, the reason of come-in population moves to the rural-urban fringe area, and the strategy to anticipate urban development in the rural-urban fringe area based on combination model.

Chapter seven will provide overall conclusion of the research. The research framework of the dissertation can be seen in the flow chart bellows:

### **1.5 Research framework and analysis scheme**

The research framework of the dissertation can be seen in the flow chart bellows (please see page 1-4):

**Chapter-1**

**Background**

- City center is insufficient for urban population
- Migration and congestion increases due to additional traffic volume
- Agricultural-land conversion in the rural-urban fringe area
- Mixed land use, social and demographic characteristics, lying between the continuously built-up urban and sub-urban areas of the central city and the rural hinterland.



**Problem determination**

- Where is the location of rural-urban fringe area?
- How does the physical change of rural-urban fringe area?
- How does the characteristic change of rural-urban fringe area?
- What are the strategies of rural-urban fringe area to anticipate urban/regional development?



**Objectives of the research**

**The main purpose** of this research is to improve the policy of rural-urban planning related to urban development in rural-urban fringe area. Thus, **the objective** divided into several goals, namely:

1. to identify and examine the location of rural-urban fringe area based on combination model
2. to identify the physical and social-cultural change of rural-urban fringe area
3. to identify the characteristics change of rural-urban fringe area, and
4. to examine an appropriate strategy to anticipate urban development in rural-urban fringe area

**References**

**Chapter-2**

**Land-use of 4 sub-districts**

- Blimbing
- Lowokwaru
- Sukun
- Kedungkandang

**Identification: location of rural-urban fringe**

Observation (GIS): Spreading of building map, spreading of agriculture-land map, land-use map)

**Criteria**

**Urban-rural land use model**  
(Pryor, 1968; Yunus, 2000)

**Spatial structure model**  
(Ruswurm, 1975)

**Proposed new model**  
(Agustin and Kubota, 2010)

**Evaluation**

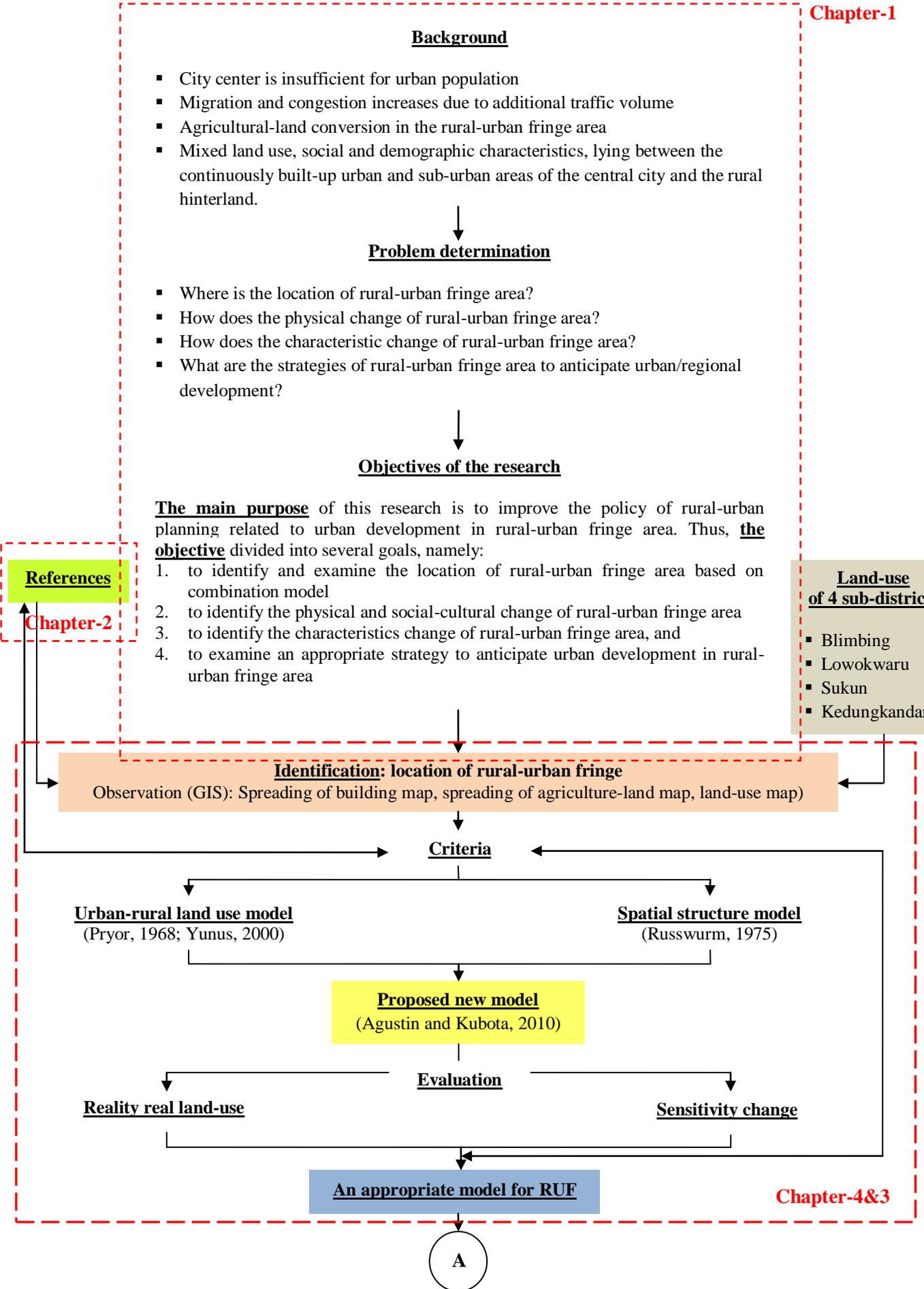
**Reality real land-use**

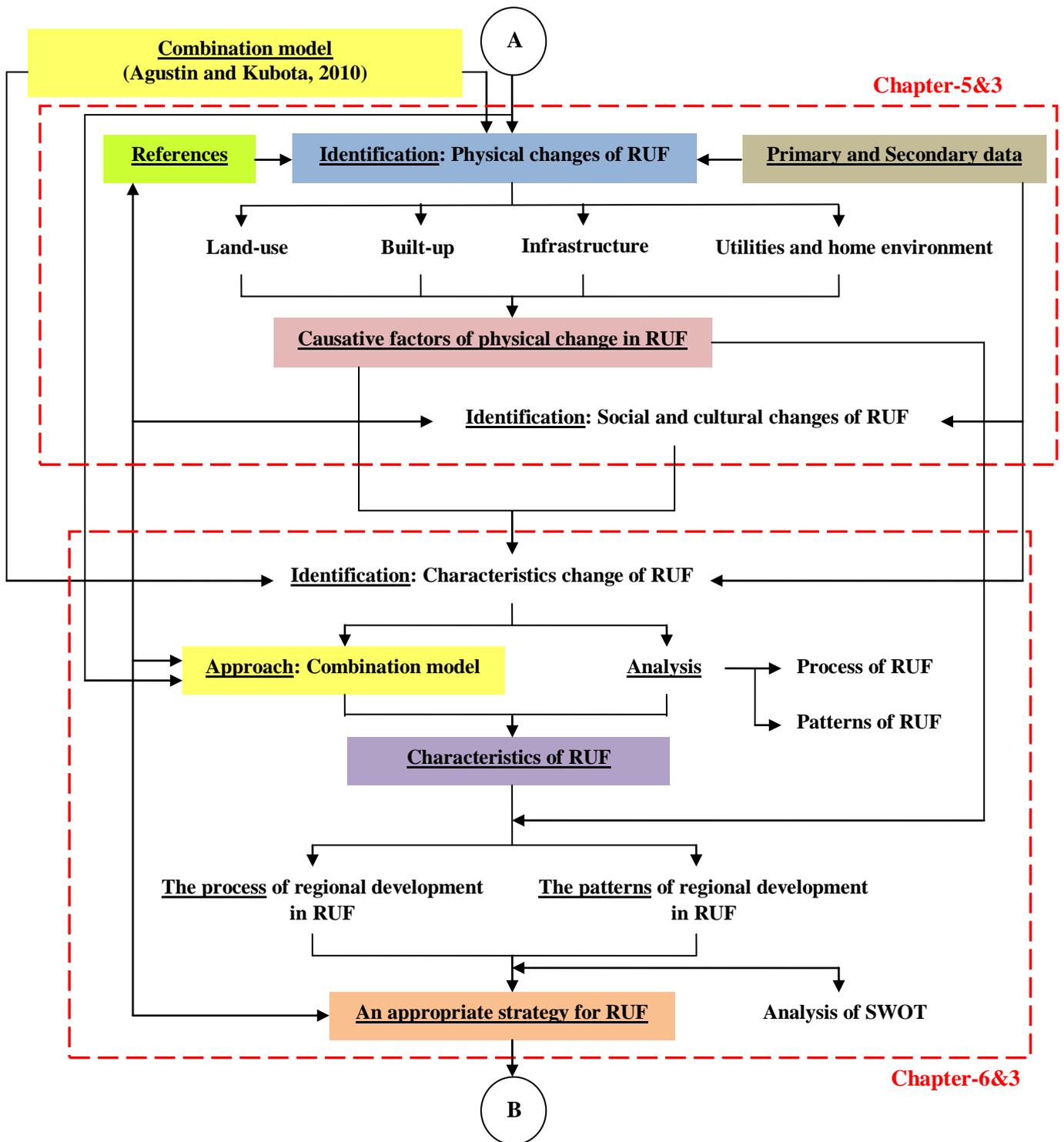
**Sensitivity change**

**An appropriate model for RUF**

**Chapter-4&3**

A

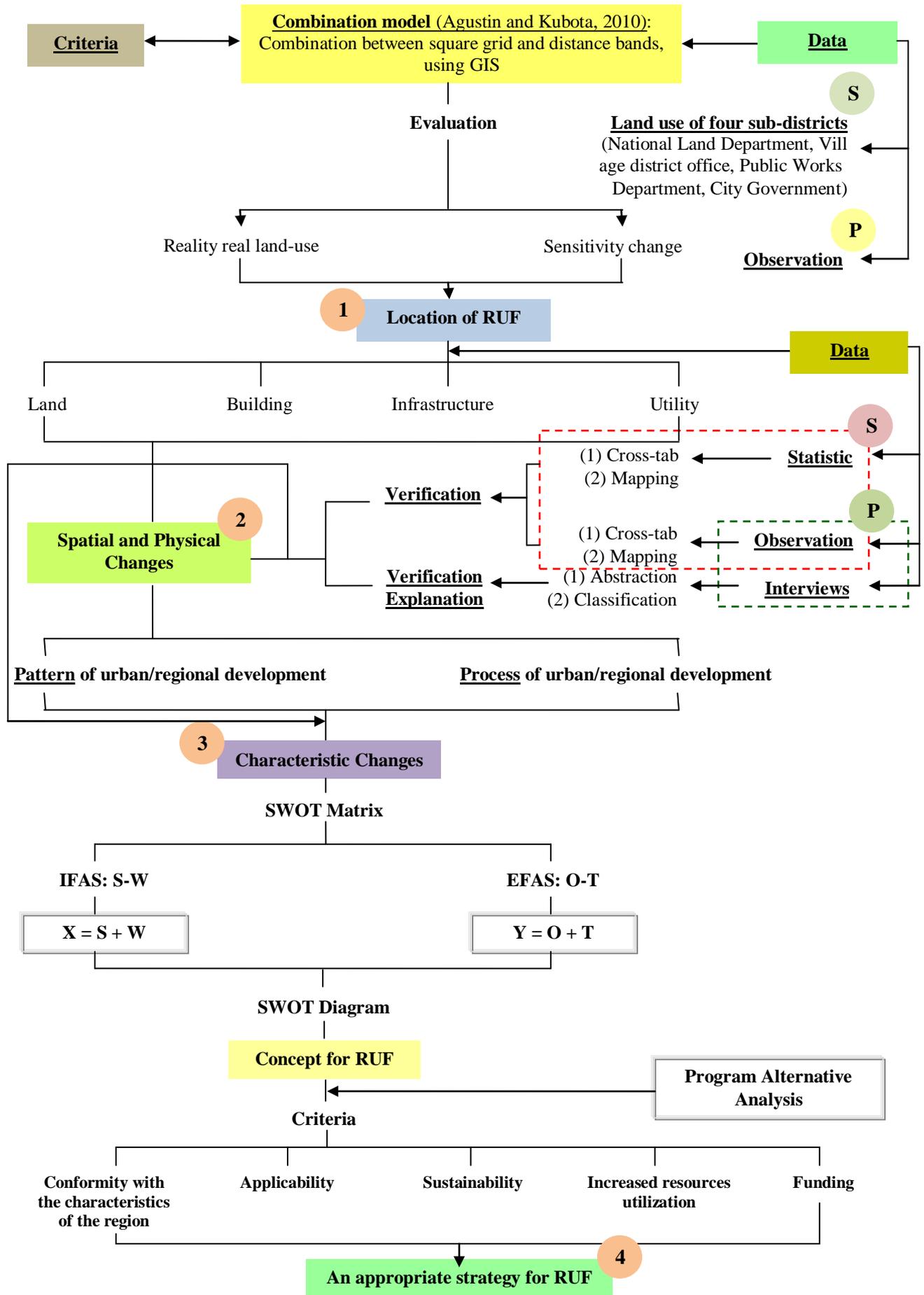




This research is divided into four analysis schemes as follows:

1. analysis scheme of rural-urban fringe area location,
2. analysis scheme of physical changes of rural-urban fringe,
3. analysis scheme of characteristic changes of rural-urban fringe,
4. analysis scheme of an appropriate concept and strategy to anticipate urban/regional development in the rural-urban fringe area

Analysis scheme of the research can be seen in the flow chart bellows (please see page 1-6):



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## CHAPTER 2

### RURAL-URBAN FRINGE

#### 2.1 Definition of rural-urban fringe

There are many definitions about rural-urban fringe, it is described below:

- The rural–urban fringe is the landscape located just outside of established cities and towns, where the countryside begins. The fringe characterized by diversity in land uses, with many areas in continuous transition (Friedberger, 2000; Sullivan and Lovell, 2006).
- The rural-urban fringe is the area of transition, between well recognized urban land uses and the area devoted to agriculture (Wehrwein, 1942).
- The rural-urban fringe ‘is the zone of transition in land use, social and demographic characteristics, lying between (a) the continuously built-up urban and suburban areas of the central city, and (b) the rural hinterland, characterized by the almost complete absence of non-farm, dwellings, occupations and land use,...’ (Pryor, 1968).
- “In the vast field of rural urban relationship a topic of particular interest and importance is the fringes of the cities....those zones where the cities, in the course of their growth, are transforming tracts of rural territory and society into city areas.” (Leeming and Soussan, 1979).
- “The zone which lies immediately outside the city area, and has strong interaction with the city proper in terms of daily commutation, exchange of goods and services and bears an urban reflection on the physical, occupational and demographic structure.” (Nangia, 1976).
- “Is neither urban nor rural but combines the futures of both. In other words it is a transitional area which is in the process of rapid change under the influence of expanding city” (Gopi, 1976, 1978).

#### 2.2 Definition of sub-urban and peri-urban

Peri-urban areas can be described as those immediately adjoining urban areas, localized outside formal urban boundaries and urban jurisdictions, which are in a process of urbanization and which therefore progressively assume many of the characteristics of urban areas. The peri-urban areas are also seen as an interface between the urban and rural areas, also called the transition zone or interaction zone, where urban and rural activities are juxtaposed, and landscape features are subject to rapid modifications, characterized by strong urban influences, easy access to markets, services and other inputs, ready supplies of labour but relative shortage of land and risk from pollution, urban growth and waste disposal problems.

Peri-urban components are:

- More sanitation service providers.
- More equipped in infrastructures.
- Less space for construction.
- High population density.
- Higher opportunity for market development.
- Possible Intervention of decentralized national water and sanitation services



**Figure 2.1** The peri-urban components (<http://www.netssaftutorial.com/Differentiating-between-peri-u.499.0.html>)

Rural areas are settled places outside towns and cities and they are distinct from more intensively settled urban and peri-urban areas. Their inhabitants generally live in villages, hamlets, on farms and in other isolated houses. For instance, rural areas in West Africa are characterized by low population densities, small size and relative isolation, agricultural production as the major economic activity and homogeneity of the people in their values, attitudes and behaviour. Rural areas have poor access to infrastructural facilities such as markets, banks, schools, hospitals etc.



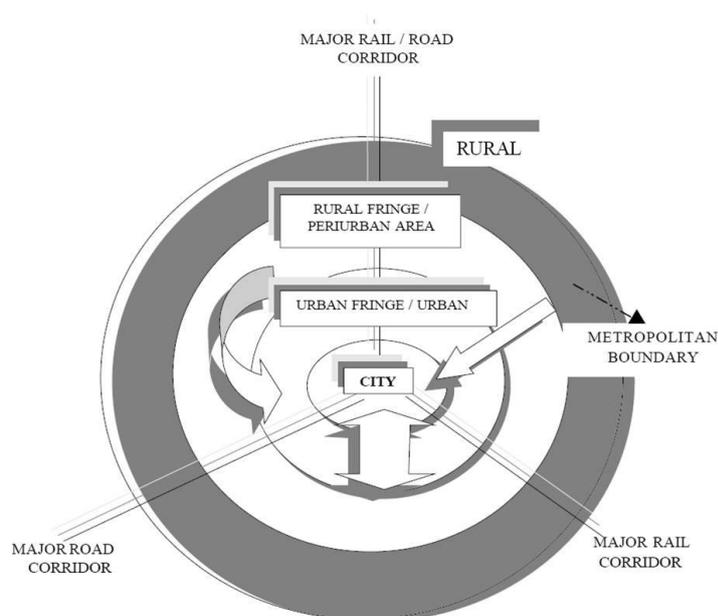
**Figure 2.2** Rural components (<http://www.netssaftutorial.com/Differentiating-between-peri-u.499.0.html>)

Rural components are:

- Absence of infrastructures.
- No service providers.
- More space for construction.
- Low population density.
- Higher need for training.
- Bigger potential for reuse of sanitation by-products.

- Limited access to media, and difficult to access.
- Worse institutional representation.
- Due to transportation of needed resources, construction costs could be higher.

Nevertheless, both peri-urban and rural areas have similar characteristics which include inadequate sanitation systems and infrastructures to meet basic needs, as well as a significant proportion of residents living in the lower income categories. These characteristics are to be taken into consideration when planning sustainable sanitation projects, since factors affecting the peri-urban locations vary from those affecting locations in the rural settings. The following lists defined some of the main components of the peri-urban and rural areas, establishing a differentiation between them.



**Figure 2.3** Concept of formation of PU areas (Thirumurthy, 2005)

The concept of *peri-urban* emerged due to limitations in the dichotomy between rural and urban.<sup>i</sup> Much research has identified the inadequacy of this simplistic dichotomy,<sup>ii</sup> some authors even suggesting its analytical relevance is long past.<sup>iii</sup> Others have argued more specifically that only the dichotomous construct has outlived its usefulness not the underlying distinction between degrees of *ruralness* and *urbaness* (Rambaud, 1973).

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For example, Hewitt argues that rural itself is not a "single category but a complex continuum from more rural to less rural" and varying extensively "based on (1) proximity to a central place, (2) community size, (3) population density, (4) total population, and (5) economic/socioeconomic factors"

Julliard (1973) argues that the urbanization of the countryside (i.e., the integration of rural inhabitants into new economic and social relations with town-dwellers) can be interpreted either as the obliteration of the countryside or as the cooperation of rural and urban inhabitants, resulting in the disappearance of the town/country dichotomy.

Stahl (1973) examines Romania and concludes that disparities between towns and villages are disappearing, not because villages are becoming towns but because they no longer suffer from social and economic underdevelopment. These changes are arising from a combination of urbanization, de-ruralisation (i.e., urbanism as we have defined it herein), and modernization (of agricultural techniques and formation of farming cooperatives) which alter both the composition of the rural population and the structure of the agricultural family.

On a conceptual level, the formation of peri-urban (PU) areas is assumed to be related to the shortcomings of urban centres, such as lack of adequate infrastructure, deteriorated environment, which push the development beyond the traditional city limits, creating a strong influence on these areas (Thirumurthy, 2005). However, urbanization beyond the city limit is not only due to urban pressures but also to the easy accessibility through the availability of transportation corridors. This means that urbanization in the area beyond the city, can be identified as a process which transforms rural areas into urban area passing through the PU stage (Figure 2.3). Therefore, it is likely that today's PU areas will become the urban area of tomorrow, if the transportation network is extended and the inflow and outflow of resources is facilitated.

A major emphasis in the PERI-URBAN project was placed on definitions of the notion of "peri-urban" (PU). Since clear definitions are still crucial to the analysis the generally agreed results are summarized in Deliverable 5 which identifies three main approaches for the definition of peri-urban interface (PUI):

- The PUI as the periphery of a city
- The PUI as a socio-economic system
- The PUI as the interaction of rural-urban flows

PU has been traditionally defined as 'the edge of the city', the 'urban fringe' or as the 'spatial transition zone between urban and rural areas'. A recent example of this type of approach is the concept of 'footprints':

*"A city's landscape footprint includes the ecologically productive land, water and natural and semi-natural landscapes that the city consumes, permanently changing its traditions uses and cover (Morello, Matteucci et al. 1998)".*

This definition makes clear that spatial proximity to urban areas is an essential factor in the definition of PU. The approach seems entirely consistent with a "natural science" analysis of PU areas (Timms and Hodgson, 2005).

Other approaches to the conceptualization of the PUI move away from its physical features and focus on its socio-economic characteristics. 'Peri-urban' is understood as a social category, regardless of its spatial dimension. In other words, PU communities are those which have a dual urban-rural orientation in social and economic terms.

Established theoretical definitions of urbanism identify three main components of PU development:

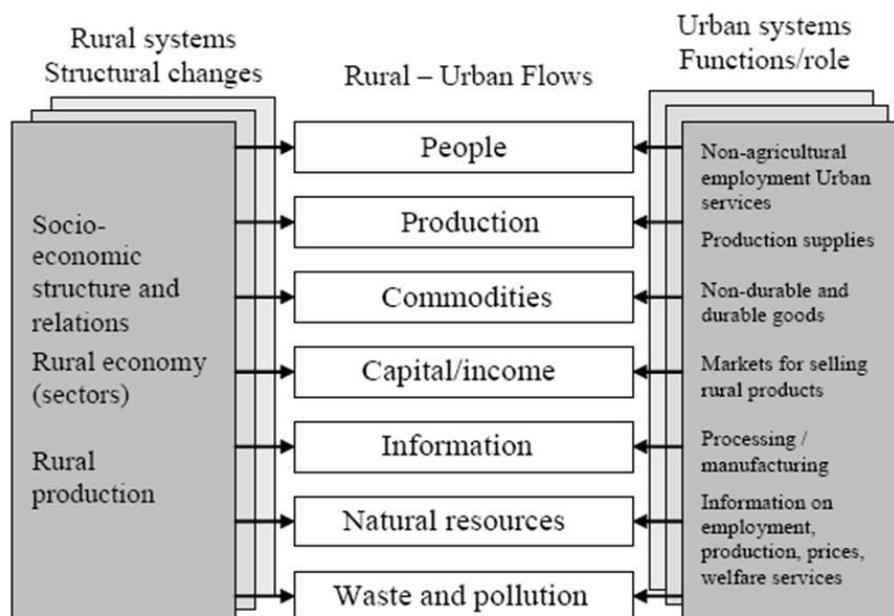
1. The demographic component, i.e. increasing population size and density
2. The economic component, i.e. primarily non-agricultural workforce
3. The socio-psychological component

Iaquinta and Drescher (2000) argue that the socio-psychological component is most often omitted from PU definitions; this fact underestimates the prevalence of social change. They distinguish five categories of PU settlements. Only four of them have spatial proximity to urban centres within their definitions, thus, underlining that spatial proximity is not essential.

A third approach attempts to explain the nature of the PUI by looking at the dynamics of rural-urban links and flows at the regional level (see Figure 2.4). PUI are assumed to be areas where urban-rural linkages, changes and conflicts are most intense. These flows are the

expressions of people's strategies for survival; they include flows of resources between PU, urban and rural areas. The key advantage of this definition is that the notion of flows intrinsically includes transport.

Another advantage is the emphasis on the dynamic nature of the PUI, focussing more on processes than on states. This approach may be particularly appropriate given the rapidly changing nature of social and economic relations within PU communities.



**Figure 2.4** Rural-urban flow (Thirumurthy, 2005)

(Thirumurthy, 2005) identified the socio-economic driving forces at work as:

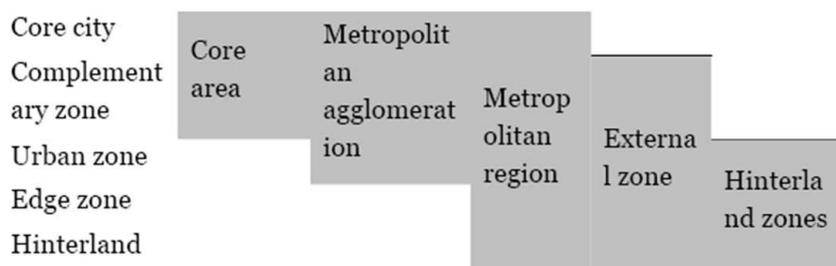
- The population growth in the cities due to migration leading to increased land prices in the city
- Increasing congestion and deterioration of living environment in the city
- Higher transportation accessibility
- The availability of health and education facilities outside the city
- The desire to own a house at affordable prices
- The availability of communication facilities outside the city
- Community and friends influence

The meaning of a suburban area is a residential or district located on the outskirts of the city. It is bounded by major cities and characteristically made up of sole family separated residences, with more green space and characterized by low population density. During the 1930s the rate of suburban growth was actually not as much as during the 1920s. In the case of the Standard Metropolitan Areas, the central cities increased 13 per cent between 1940 and 1950 as compared with a 34.7 per cent increase of population in the outlying areas. Population residing outside these metropolitan areas increased by only 5.7 per cent during this period (Walter. T. Martin, 1953).

While suburbanization and urban sprawl are intuitively apparent and despite the variety of theoretical concepts, 'hard' empirical evidence is still relatively scarce. The relevance of such evidence is not just to confirm the existence of the phenomenon *per se* in the long term but to

highlight the quantitative magnitude of the development and to find out whether suburbanization is still continuing.

Bronger (2004) points out that the major obstacle to empirical measurements is the problem of an appropriate delimitation concept for urban agglomerations and suburban areas. However, he finds the classification sketched out by Boustedt (1975) most appropriate which structures the urban agglomeration areas based on a demographic and functional transformation process (Figure 2.5). On the basis of this concept he distinguishes several suburbanization types to account for the spatial scopes of different process stages.



**Figure 2.5** Position of urban agglomerations (Boustedt, 1975)

Sub-urban and peri-urban are clearly different. The differences between sub-urban and peri-urban are as follows:

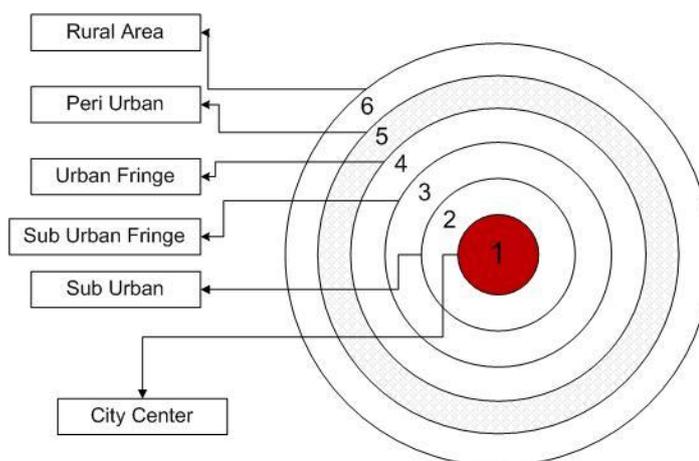
**Table 2.1** The differences between sub-urban and peri-urban

Differences	Sub-urban	Peri-urban
Land-use	Land use in the suburban area is residential and manufacturing areas. Sub-urban is more dominated by residential.	Land use in the peri-urban area is a blend of mostly rural land use is agricultural land and urban land use. Land use changes in the peri-urban areas is due to the growth of the city centre increases, so the developers utilize in the peri-urban areas that the price is cheaper.
Population	Residents in the suburban areas are residents who work in the city centre. Suburban is a local place or area where the commuters live not far from the city centre. Commuters are people who live in the suburbs who commute into the city to work every day.	Residents in the peri-urban is a mix between settlers and the natives.
Location	Suburban located around the city centre. Suburban areas due to the formation of the	Peri-urban located between urban and rural. The nature of the Peri-urban is one

growth that occurred in the city center increases, so that no more land for development, especially residential development. The emergence of the suburban areas as public transportation has been through this area and the distance to the city centre is also close.

hundred per cent rural and one hundred per cent urban.

Position of the sub-urban and the peri-urban can be seen in Figure 2.6.

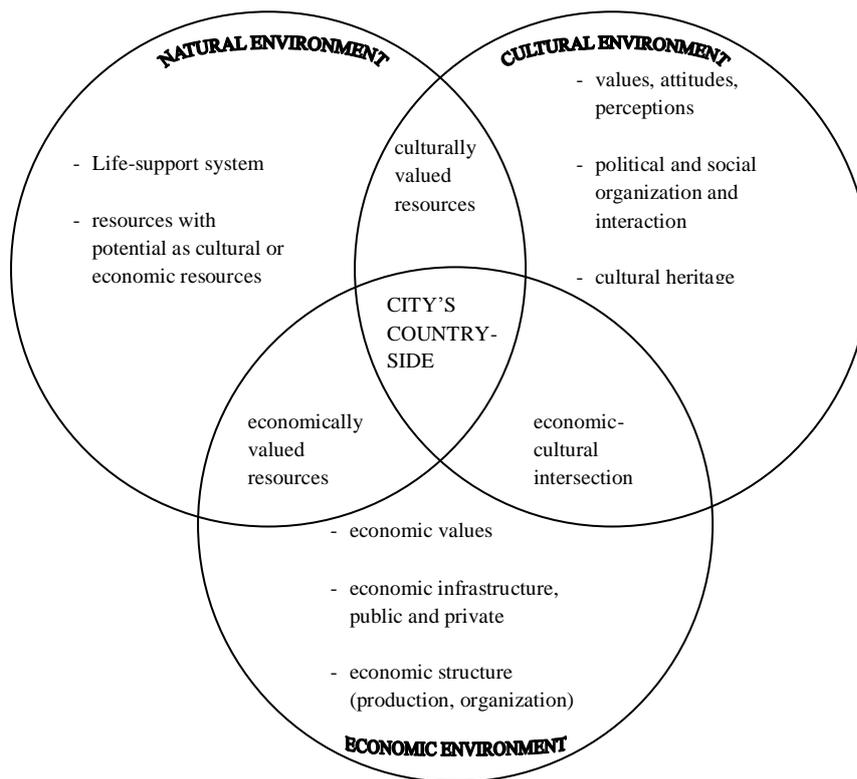


**Figure 2.6** Position of the sub-urban and the peri-urban (David L. Iaquina and Axel W. Drescher, 2000)

### 2.3 Environments of the city's countryside

Bryant, Russwurm and McLellan (1982) explain about the city's countryside as a part of the regional city system. It can be viewed as comprising three overlapping environments: natural, economic and cultural. Figure 2.1 describes the natural environment provides the support systems for life such as food, air, water and other resources; the economic environment contains the activities through which natural resources and human resources are used to provide for human needs; and the cultural environment, including social and political subsystems, consists of those activities primarily undertaken for motives other than profit or making a living. Involved in the cultural environments are cumulative group interactions, individual human interactions, group-individual interactions and subsystem interactions of the cultural environment with the economic and natural environments.

Russwurm (1980) also explain that the natural environment contains the basic life-support systems for human society, as well as resources, both actual and potential. An actual resource is a component of the natural environment that is valued by society, either for economic or cultural reasons. Components of the natural environment are potential resources when they are neither economically nor culturally valued, either because they possess no inherent value or because their value is not recognized as such.



**Figure 2.7** Intersection of environments in the city's countryside (Bryant, Russwurm, and McLellan, 1982:19)

## 2.4 Definitions and characteristics of the city

According to Indonesia's Spatial Law (Undang Undang Tata Ruang—UUTR) no. 24/1992, the city is the main area that has no agricultural activity with the composition of the region functions as an urban settlement area, centralized distribution of government services, social services and economic activity. Whereas according to paragraph (pasal) 14 and 15 Indonesia's Basic Agrarian Law (Undang Undang Pokok Agraria—UUPA) 1960, the city is the center-community. Some experts mentioned as follows (Imam A.A. Sapari, 1993:15):

- A place where residents can meet most needs in the local market economy, with goods produced by the inhabitants of the interior and marketed there. So characteristic is the existence of a market town as a fortress and have the legal system and is cosmopolitan (Max Weber).
- Organizing function for the regions surrounding the provision of services. As the center depending on how much the surrounding area using existing facilities, which are arranged by type of hierarchy (Christaller).
- Incidence 'literals' faction (ancient intelligence group) or various socialist groups of educated and non-agrarian, so there is a certain division of labor, which is one of the city (Sjöberg).
- Settlements are relatively large, solid and permanent, inhabited by people of heterogeneous social status, social relationships that result in a loose, indifferent and not personal (Wirth).
- A network system of human life which is marked by social strata are heterogeneous and patterned as a bulwark of cultural materialistic or caused by natural elements and non-

centralization of symptoms experienced by a large population with heterogeneous life styles and materialistic than in the rear (Bintarto).

According to Ilhami (1990:3), the city has a sense that is:

- a) City as a place with regional administrative boundaries as defined in the regulation.
- b) City as an environment characterized by non-agriculture urban life that serves as a center of growth and settlement centers.

Function of the city is as health center and recreation center. The city serves a double or multifarious, as a center of culture, trade and commercial center serving the surrounding area, the central government, and as a production center of intermediate goods (barang ½ jadi) or end-product supplies (barang jadi). Urban functions can also be added as a vehicle rear area services, inter-regional transportation center, the center of settlement, primary functions and secondary functions (Imam AA. Sapari, 1993:15).

## 2.5 Aspects of city-forming

### 2.5.1 Physical aspects

The physical aspects include land use pattern, land use regulation and space are a natural resource. The theory of land use is proposed by some experts as follows:

- Guttenberg, 1960: describes the structure and accessibility of urban development in the form of minimizing the distance traveled by the central settlement service. Spatial structure prevent that has spread because transportation facilities are inadequate.
- Wingo, 1961: matters relating to the spatial structure of cities that focused on urban settlements associated with urban transportation.
- Alonso, 1964: the development of interaction between land value and land use that took place in several stages.
- Kilroy, 2007: two aspects related to community linkages to move into the city, namely the functional and social aspects. Space as a productive agent is also a symbol of location selection on the basis of market considerations and responses to social values.

Spatial pattern reflects the structural and spatial use either a planned or not. There is the spatial arrangement of space and space utilization control process by taking into forming elements:

- the use and land-use plan
- the needs and desires of individuals
- infrastructure
- type and function of building
- individuals or groups activity who routinely
- population
- physical potential
- location of site support facilities
- perception and behavior

Physical aspects are used in the study of rural-urban fringe area development concept in Malang City including land use and building patterns. The physical aspects are used as study material development pattern region of Malang City.

### 2.5.2 Social aspects

The problems associated with the city of residence, namely: issues of development, migration, economic activities, labor, and the burden of dependency. The population can be an indicator of urban development in a planning, which one of its aspects is a movement. The driving factors behind the movement according to Charles Hammond Whyne is progressing the field of agriculture, industrialization, market potential, increase in service activities, improvement of transportation, social and cultural attractions, the advancement of education and natural growth.

Aspects pertaining to human resources consist of:

- State population (number, distribution, structure, religion, education, income, etc.)
- Population processes (natural and artificial)
- Social environment (control patterns and construction activities)

### 2.5.3 Economic aspects

Economic development learns about the course of economic developments and analysis the causal relationship of these growth factors. Baldwin and Meier are revealed six properties located in the city economically poor countries or in developing countries, namely:

- producers of primary goods or production of the agricultural sector
- the problem of population pressure in the form of unemployment in the country, rapid population growth, high birth rates
- natural resources has not been widely cultivated, it is still potential
- population is still underdeveloped, the quality of the population is still low
- lack of capital, due to low levels of investment
- orientation to overseas trade

Economic aspects which are used in this research include a commitment of farmers to their agricultural land, the commitment of farmers to their agricultural activities and the selection of residential preferences of migrants. It is also important to note that the aspect of economic used as a study material of the process of regional growth in the rural-urban fringe area of Malang City.

Baldwin and Meier (1957) also set conditions that must be met for development to run as expected, namely:

- Forces of nature to flourish; community itself to raise the level of his life.
- Mobility of production factors; need to put effort and capital.
- Criteria and direction of investment; must have criteria and direction for the allocation of capital.
- Capital absorption and stability
- Values and institutions
- Capital accumulation and higher volume of real savings

### 2.5.4 Transportation aspects

Accessibility is an important factor in supporting the growth and development of the city. General principles that serve as guidelines for urban dwellers in adapting to the environment associated with the ecology of cities, namely: the minimum cost principle, the principle of median location, and routine transportation routes affected residential areas.

## 2.6 City development

Rahardjo (2001:37) explain urban development significantly changes experienced by urban areas in the aspects of life and livelihood of the city, from nothing into existence, from the few to be many, from small to large, from the broad availability of land limited. Rahardjo (2001) said several variables influencing the use of space are:

- Population; circumstances, processes, social environment.
- The strategic location.
- The function of urban areas.
- Completeness of social and economic facilities.
- Completeness of facilities and transportation infrastructure.
- Land suitability factor.
- Factor of progress and improvement in technology.

Urban development in Indonesia can be described as follows:

- Some cities formed, and experienced began after the independence Stadgemeente.
- State of new towns can be called as a collection of villages where the nature of the area (center) settlement with dense population, has not indicated the nature of the local industry and commerce.
- Most of the city is still the center of the district administration which has no particular status. In contrast, only a small city has status as an administrative town or city.
- More cities serve as regional marketing of agricultural produce from surrounding areas rather than functioning as the activities of labor and other services.

According to its speed, urban development can be classified into three regions with the development:

- Quickly classification, characterized: in-migration flows increased each year, influenced by developments in the surrounding cities, and attractions of the area function.
- The classification of "medium", characterized by land conversion for development programs in accordance RUTRK, livelihoods transformation is quite high with limited employment options.
- Slowly classification, characterized by the transformation of agricultural land into land slightly built-up. It means that land-use change is slow.

Based on the classification has mentioned, the city development of Malang City as the study area belong to the city with the rapid development that is marked with the current "migration" is increasing every year. This influenced by the development of Surabaya City as its capital city, and the attractiveness of the region functions as an education city, town and city tourism industry.

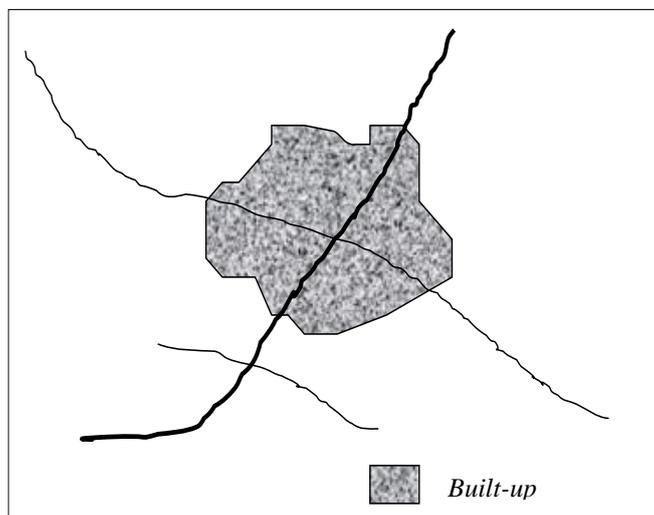
## 2.7 The pattern of city development

### 2.7.1 Concentric development

Concentric system pioneered by Ebenezer Howard in "Garden City Movement" in Britain in 1898. The concept of "Garden City" of Howard is a reaction to the depravity of the industrial city in England at that time and propagation (sprawl) City of London that are not controlled. Examples of development with concentric patterns are applied in the form of "British New

Town" City of Letchworth as a satellite town of the City of London with city planners: Richard Raymond Unwin and Barry Parker.

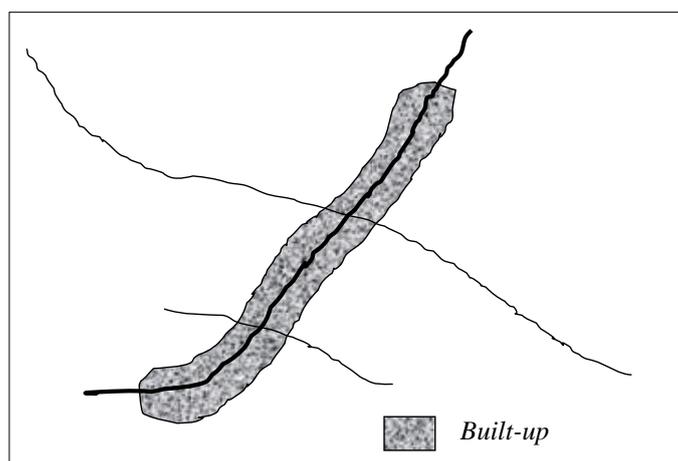
Concentric pattern begins with the development of urban centers and functional activity within a point and then gradually develop in the next outer layer.



**Figure 2.8** Concentric Development Model (Northam, 1971; Yunus, 1994)

### 2.7.2 Ribbon development

The development of the city with ribbon form pioneered by Don Arturo Soria Y Mata with the concept of "La Ciudad lineal" for the City of Madrid, Spain in 1882. The theory based on regional transport artery, where the city is considered as an organism that grows and develops, residence isolated from traffic by placing the housing facing the side street and away from the main road.



**Figure 2.9** Ribbon Development Model (Northam, 1971; Yunus, 1994)

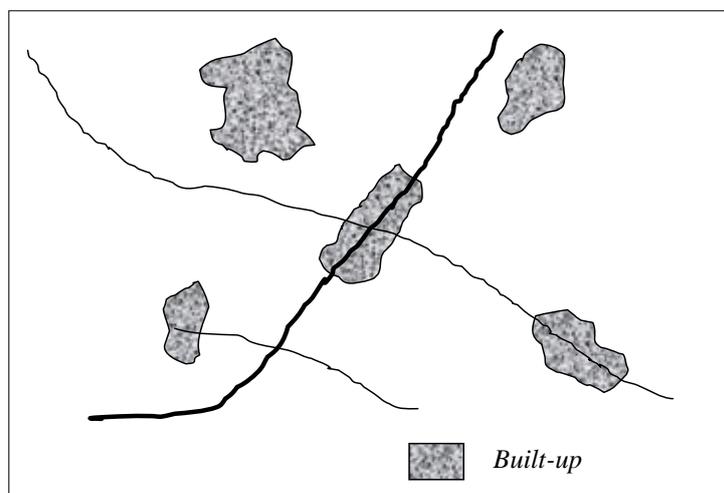
Hansen (1959) suggests:

*"An empirical examination of the residential development patterns illustrated that accessibility and the availability of vacant developable land can be used as the basis of a residential land use model."*

The development of Malang City itself also has the accessibility factor as the driving development of the city, so there is indicated by the form of ribbon development in the rural-urban fringe area.

### 2.7.3 Leapfrog development

The pattern of development in leapfrog ("lompatan katak") is a development pattern that is not patterned. Leapfrog development pattern indicated by the uncontrolled development at land where the jump, so that the land filling of "jump pattern". It becomes urgent and easy to occur over the functionality into the built-up area. Malang City has indicated the type leapfrog development to meet the needs of increasing population activity function. Housing development is not patterned also may be indicated as part of a pattern formed by leapfrog. So that can be estimated that the urban fringe area of Malang City has also indicated the type leapfrog.



**Figure 2.10** Leapfrog Development Model (Northam, 1971; Yunus, 1994)

The pattern of the division or expansion of the city following the transportation routes are also proposed by Hoyt (Daldjoeni: 1998), the complete pattern of the division or expansion of the city according to Hoyt, as follows:

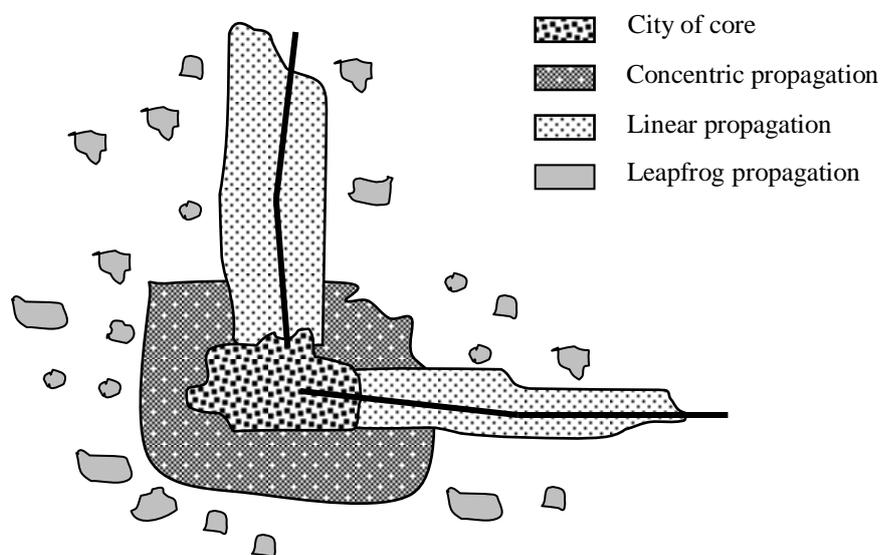
- The expansion follows the growth axis or in other words. The expansion will follow the route of transportation into the city's border areas. Thus, the pattern will form a star or "star shape".
- Hinterland areas outside the city will grow and eventually merge with the larger city.
- Combining the core cities with smaller towns outside the city core or referred to as the conurbations.

Based on morphological appearance of the city and the type of propagation, Yunus (1994) proposed several models of urban form according to Hudson, as follows:

- Satellite forms and the new centers. This form illustrates that the major cities with smaller towns around it established such that the functional relationship more effective and more efficient.
- Stellar or radial form. The form of this city occurred in the city that the development of his city dominated by the "ribbon development".
- Ring form, composed of several cities, that is developed along the main road that circle.

- Beaded linear form. The growth of city limited, it is only along the main road. The pattern of the city is linear. In this pattern, there is a chance to develop into the side without physical constraints.
- The core/compact form. It is a form of urban development area which is usually dominated by vertical development.
- Scattered form. It is a unity of form with a large and compact morphology with several "urban centers", but each center has a group of specially functions and different from each other.

Based on expert opinion that stated above concerning the patterns of physical development of the city, all of them have much in common. The general pattern of physical development of cities can be grouped into three: (1) Concentric development; (2) Linear development follows the pattern of the road network; (3) Leapfrog development established new growth centers.

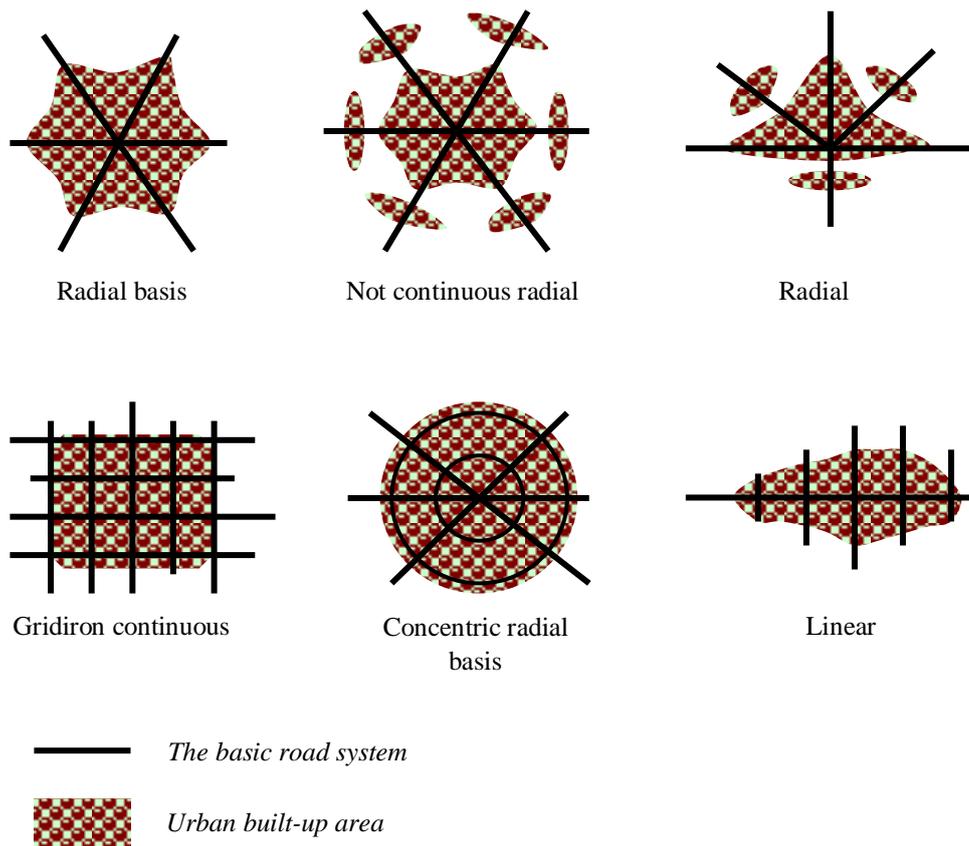


**Figure 2.11** Physical Propagation Model of the City (Northam, 1971; Yunus, 1994)

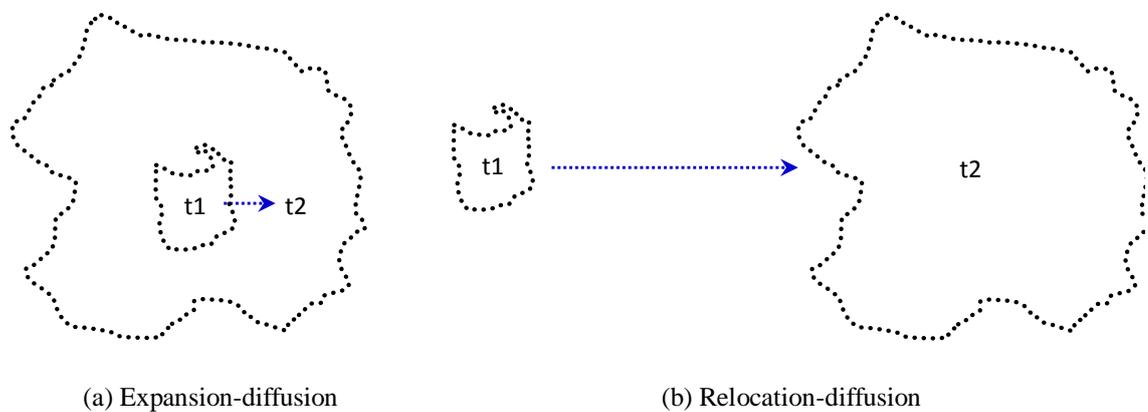
Assessing the physical growth of a city, according to Hagget (1970) to refer to the theory of the spread/propagation which have two models. They have a different purpose. These models are the diffusion model of expansion and relocation diffusion model, with the following explanation:

- Expansion diffusion is a process of dissemination of information, materials and so on, spread through a population from one region to another. In the process of diffusion of this expansion, information or materials that in-fused still exist, and sometimes become more intensive in its original place. One example of the diffusion process of expansion is the occurrence of population growth within a certain time which distinguished in two periods of time. Thus, there is space in the expansion population growth, materials and new residential space.
- Another diffusion model is relocation diffusion: a process of spatial distribution, namely information or materials that in-fused to leave the area of origin and move to a new area. For more details, both diffusion methods can be seen in Figure 2.13.

Branch (1995) revealed six patterns of physical development of cities. A schematic can be described as follows:



**Figure 2.12** Six Patterns of Physical Development of Cities According to Branch (1995)



**Figure 2.13** Expansion-diffusion and Relocation-diffusion Model (Hagget, 1970)

## 2.8 The process and effects of the development of “physical appearance” of the city

Along with the increasing urban population, it will lead to increase demands of life in economic, social, cultural, political and technology. That resulted in the need for urban space is increasing. Increased demand for residential space and position functions are always going to take space in the suburbs (rural-urban fringe area) because of the availability of space within the city fixed and limited. Symptoms propagation area of the city referred to as the

'invasion' and the process of the development of physical appearance to the outside of the city known as 'urban sprawl' (Northam, 1971).

The development of cities in Java at this time is marked by an internal restructuring process in the cities, both social-economic and physical. One of the prominent features in this process, as shown in the greater JABODETABEK (Jakarta, Bogor, Depok, Tangerang, and Bekasi) area is a shift in the core city functions from manufacturing center to center services, including financial, while manufacturing activity shifted towards the outskirts of town (Firman, 1997:213). Further said that:

*“Physically restructuring process characterized by changes in land use, both in the core or rural-urban fringe. Urban areas experienced a change of land use is intensive from a residential area into a business district, offices, hotels, and etc. On the other hand, there has been conversion of land use on a large scale of agricultural land into the region industry and settlement in the suburbs.”*

In relation to the population problem and the problem of space utilization, especially in the big cities, Ilhami (1990:54-55) suggests the most appropriate way to solve it. In addition to enhancing the urban facilities, also need to develop new towns or cities around it in order to progress in the big city to the surrounding areas. The main goal is to form new growth points in the vicinity of large cities, which at present still has the strength of a big attraction to the population (reflected in the high level of urbanization from rural to urban areas). The existence of the points of new growth is expected to offset the appeal of the big city, so as to inhibit the population in the area surrounding the desire to move to the city center. Thus, the balance between the big city with the development of regions and cities around it will be realized, because the big city with growth centers around it is a series of functional and physical systems that require each other. The implementation of this de-concentration development has two ways: firstly, by building new cities (New Towns) as centers of growth with consequences too expensive; secondly, to develop small towns or villages that already exist in the vicinity that has the potential to develop into urban areas. In this way, the second approach is deemed more feasible implementation.

The second approach is possible can be done by placing public facilities in the rural-urban fringe area. This way, expected to serve as one of the potentially to develop these area into urban area, this will be further investigated.

Yunus (1991:7) describes several factors that attract newcomers from city to suburb as follows: (1) Suburban area with distinctive characteristics that draw people from the city to settle into the area, (2) The increase of the number of new arrivals disrupt the land use situation in the suburbs, (3) The development of urban influence on land prices and lead to land speculation, (4) The loss of agricultural land should be addressed through local development planning should be arranged as soon as possible to prevent the emergence of slums, (5) The strength of spatial, situational, and social evaluation was instrumental in the centrifugal movement of population. In contrast, the force of social evaluation, and determine the functional strength of centripetal movement. Lyon (1983:4) suggests some problems caused by suburban development, namely:

- The loss and the breaking up of farmland
- Impact of development on the economic viability of agriculture
- Rising land prices in rural areas
- Wealth tax is not fair

- Development of public services that spread
- Land use conflicts
- Social and political tensions between new and old residents in rural areas
- Environmental disturbance

It is clear from the above description that the shift of the physical appearance of the city to the suburbs can be seen from the positive side, in a sense can provide benefits. In contrast, it can also be viewed in terms of negative or it can provide a variety of problems for rural area.

## 2.9 Factors that influence the pattern of physical development

The development of a city in general is strongly influenced by the situation and the internal and external conditions (Branch, 1995). Some internal factors that influence the development of the city, as follows: (a) the geographical situation, (b) site conditions, (c) the social, economic and cultural, (d) the common elements including facilities and utilities, municipalities and wisdom local government.

Bintarto (1971) explained that internal influences in the form of the development plans of city planners and external influences in the form of urging citizens. Sujarto (1989) mentions three main factors that influence the development and growth of the city, as follows:

- Human factor, that is concerning aspects of the urban population growth, either by birth or because of migration to urban areas, aspects of workforce development, social development, development of knowledge and technological capabilities.
- Factor of human activity, including aspects of work activities, functional activities, economic activities, and activities of regional relations.
- Factor pattern of movement, as a result of development caused by two factors of population growth coupled with the development activities. It would demand pattern function relationship between the centers of activity.

These factors physically manifested in changes to the demands of space requirements.

Furthermore, Chapin (1979) highlights two influences in the physical development of urban land-use changes, as follows:

- *The development of population and economic development*: the development of population relating to the quality, quantity and mobility of the population. The quality of the population associated with the state of society and social problems, while the quantity of the population associated with an increased number of population in general and seen from the composition of its population. Population mobility associated with migration whether permanent or temporary. It is considered to know the growth of the city. It is related to the economic problems of production and distribution process. In this case, residents have an importance role in running the production process, both as workers and owners of capital. The city's economic development indicated by increasing the production and distribution by industrial sector, trade and services, which these sectors in the development of its activities require land. The consequences of "the needs of land" here is the importance of the position of a strategic location for its activities. It serves as the efficiency of land. Position location is closely linked and will determine the pattern of urban land use.
- *System activities, system development and system environment*: another factor affecting land use, such as system activity, which emphasizes how people and institutions like the public, private and government agencies in meeting their needs and interactions with each

other. System of land development that emphasizes the process of change and adaptation of space for the benefit of man, while emphasizing the environmental system on patterns of life associated with ecosystems, hydrology, air and geology.

Furthermore, Russwurm (1975) suggested the existence of several factors that influence the expression of spatial appearance of the city, namely physical and non-physical factors. Physical factors include topography, geological structure, geomorphology, hydrology and soil. Non-physical factors include population growth, competition for land, land ownership rights, the activities of developers, planning and development of technology. The interaction between the factors that influence the growth of cities will create growth nodes that function as a regulator of the flow of people, goods, services and information. Based on the opinion of several experts about the factors that influence the physical development of a city, generally shows many similarities. Branch, Chapin, and Russwurm incorporate the influence of physical conditions in addition, to the influence of social, economic, and cultural. In contrast, Bintarto and Sujarto tend to see the condition of the population with all the activities of the dominant influence the physical development of a city.

## 2.10 Theory of city size

In the proposed theory, Burgess (1925), many use the term "large", "great", "largest" to a city but he did not reveal what did meant by the term. Theory of concentric shall deem suitable by the City of Chicago, especially when the city still was small, but after the city is growing rapidly and large, the concept less suitable anymore. If the concept is correct, then the spatial structure of the proposed still can be seen clearly in metropolitan cities, as well as in other cities with different classes. Sequence of spatial distribution of the city from the smallest level to "megapolitan" will show its concentric structure clearly. In the smallest towns, no differentiation of land use, in the class circle zone of settlements have been visible around the core area that still mix-ups but most of the "non-residential". At the next, class is characterized by the crystallization of "retailing" in the core areas and that began the invasion of the circle settlements etc. Some of the above is merely a characteristic class in terms of city size and city size rather than the characteristics of the growth process.

Meanwhile, other scholars began to highlight the problem. Taylor (1949) specifically highlights the cities based on growth characteristics, and the results far different from the characteristics of concentric rather than something the city. According to Taylor, there are 5 levels of growth, namely:

1. "*Infantile Towns*": characterized by the distribution of shops and houses are chaotic, and there are no factories.
2. "*Juvenile Towns*", characterized by a zone of differentiation of symptoms and shops began to separate.
3. "*Adolescent Towns*", began to have factories, but has not shown the existence of high-class homes.
4. "*Early Mature Towns*" shows a clear segregation of high-class homes.
5. "*Mature Towns*" shows the separation of commercial and industrial areas and residential zones, zones of different quality.

Although, Taylor (1949) provides verification and description of a difficult but in some ways it has importance meaning in relation to the concentric theory. The problem is that if the emergence of land use different is part and process of growth of the towns then, "*what town*

*sizes hierarchy or at what grades and in what manner does this differentiation take place and under what conditions". Burgess (1925) has raised the question of the city, but he did not express it clearly.*

Several scholars who contributed his thoughts to complete the thesis of Burgess try to understand that it is a product and the results of an inductive approach. So if a donation of thought that emerged later as "size", "building height", "axial growth", and "multiple nuclei" combined with thinking about the spread of "land use", both for the theory of concentric or sector, it will show the picture of the generalize something more real about the city (Carter, 1975). However, if all of variables are included or integrated, then the model is not simple anymore, but it would be more "complicated". This will cause the purpose of creation of a model as a simplification of reality became blurred.

Malang City is characterized by the differentiation of land use and zoning separate trade area. It shows that the City of Malang included in the category "juvenile towns". Malang City is difficult to identify the real size of the development of his town because of uneven development.

### **2.11 Administration delimitation versus morphology of city**

"Fixation line concept" approach as presented by Conzen (1960), where morphological analysis based on the area which physically indicates the appearance of urban ("townscapes"). The area bordering the area is not a city called 'built-up' area. Therefore, accelerating the growth of urban physical is not the same for every part of the outer city. The morphology of highly variable, from time to time, the physical form of the city is always subject to change, while the city administrative boundaries are relatively the same for long periods of time. Setting the boundaries of the city administration intends to give the limits of the city's problems making it easier for solutions of political issues, social, economic, cultural, technological and physical posed by the city government. The physical boundaries of the city is always changing all the time and it is often seen that the physical limits of the city has been far beyond the limits of the city administration (Yunus, 2000:160).

This condition can be found in the City of Malang is the morphology of the city limits that exceed the limits of administration. This condition can be found in the corridor road between Malang City - Batu City, Malang City - Blitar City and Malang City - Surabaya City.

### **2.12 Spatial differentiation in the land use of cities and villages**

Land use as human activity product on earth's surface shows a large variation, within both local and regional city. An understanding of land use forms that characterize the built up area, urban-rural transition area, and the countryside itself, is a matter of principle to do its spatial structure differentiation. An understanding of "urban" and "rural" also needs attention - especially "urban" related to urban life and "rural" associated with countryside life. Aspects of life itself consist of urban and countryside aspects: political, social, economic, cultural, psychological, technological, and physical. In discussing this morphological approach, someone insisted on the physical aspect, and one of which is land use.

To distinguish between types of urban and rural land use, these kinds of linkages with agricultural land became the main focus because most of the provincial land use type is associated with agricultural activities. Thus appears the term 'urban agricultural land' and 'rural agricultural land'. Lands located in urban areas (morphologically) are used for agricultural purposes, while 'rural agricultural land' has many examples and is common in rural area. Such land use includes: rice field, dry land, garden mix, etc. Thus, identifying with provincial agricultural or non-urban agricultural is not entirely correct, but linking the proportion of 'urban agricultural land' compared with 'urban non-agricultural land' is small, its presence ignored. Similarly, "rural non-agricultural land" and "rural agricultural land" types dominate land use in rural and urban areas. To dominate land use type in rural and urban, the definition of 'dominance' is used for any discussion of spatial structure in terms of land use type. The main problem lies in the transition area from the appearance of a "real urban" to "real rural" appearance. In this transition area, the domination problem appears to be blurred, especially for regions moving from urban to be rural. However, counting of land use type can be achieved with the grid system approach, administrative approach or physical approach. From the calculation of land use area in each cells (grid system approach) or 'areal units' (administrative and physical approach), the percentage of land use orientation can be known and sub-zone of each cell can be determined also (Yunus, 2000).

### 2.12.1 Morphology of cities by Robin Pryor

Pryor (1968) calculated percentage of urban land use, percentage of provincial land use and percentage of distance from the main urban area. The three components are combined in the rural-urban land use triangle model. The creation of this model based on the idea of gradual transformation from city to village or vice versa.

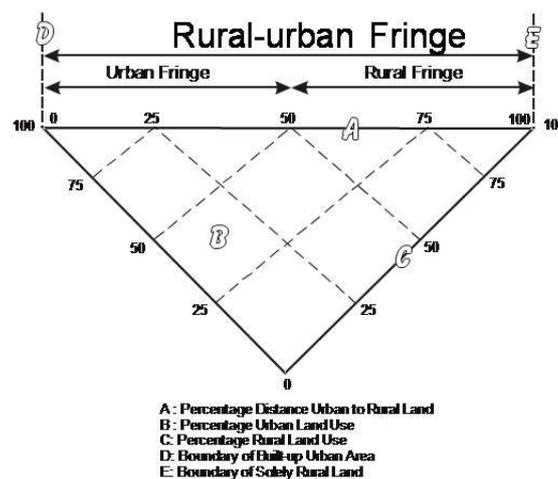


Figure 2.14 Rural-urban land use triangle model (Pryor, 1968)

The 'distance decay principle', where the further away from the 'real urban' appearance will increasingly blur in the town, also applies here. In contrast, the village became clear appearance. In other words, it can be said that the dominance of urban land use forms will increase if it is close to urban area and vice versa.

Pryor (1968) suggested four sub-zones in the 'regional city': (1) urban area, (2) urban fringe, (3) rural fringe, and (4) rural area. The urban area is the area that land use forms dominated

by urban, while the rural area is dominated by agriculture. The problem in an attempt to differentiate these zones is areas located between the urban areas and rural areas. In this case, Pryor was named the area as rural-urban fringe, which is fully defined as follows:

*“The rural urban fringe is the zone of transition in land use, social and demographic characteristics, lying between (a) the continuously built-up urban and sub-urban areas of the central city, and (b) the rural hinterland, characterized by the almost complete absence of non-farm dwellings, occupations and land use, and of urban and rural social orientation an incomplete range and penetration of urban utility services; uncoordinated zoning or planning regulations; area extension beyond although contiguous with the political boundary of the central city; and an actual and potential increase in population density, with the current density above that of surrounding rural districts but lower than the central city. These characteristics may differ both zonal and sectorally, and will be modified through time”.*

Based on rural-urban land use triangle, rural-urban fringe can still be differentiated into two distinct sub-zones, namely: (1) urban fringe and (2) rural fringe. The main support of this differentiation is the dominance of morphological appearance. Where, each sub zones described as follows:

*“The urban fringe, that sub-zone of the rural-urban fringe in contact and contiguous with the central city, exhibits a density of occupied dwellings higher than the median density of the total rural-urban fringe. The rural fringe, that sub-zone of the rural-urban fringe contiguous with the urban fringe, exhibits a density of occupied dwellings lower than the median density of the total rural-urban fringe. Furthermore, the rural-urban land use triangle model combines the concept of urban invasion with the heterogeneous land use typical of the fringe”.*

Pryor (1968) raised the issue of land use as the basis of the dominance of the introduction of sub-zone quantitatively, but there are still things that are confusing, especially in areas that the proportion of urban land use in balance with the proportion of its land-use village.

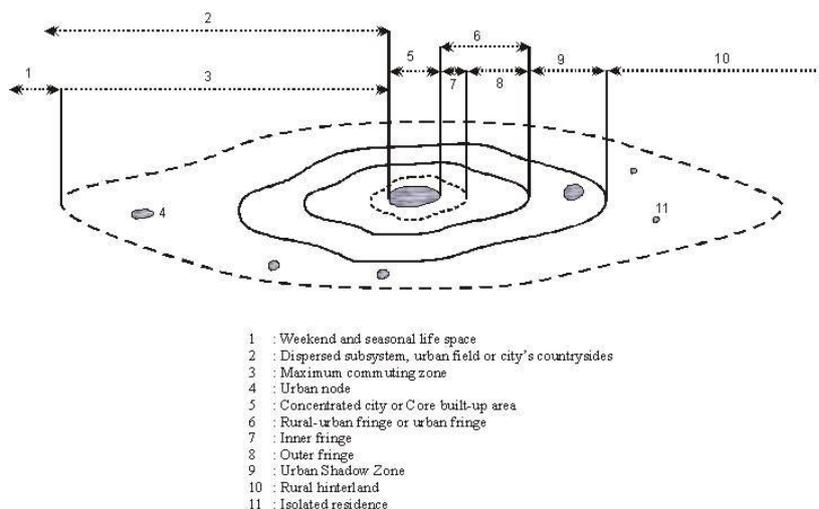
In the model of land use, the limits of "urban fringe" with "rural fringe" in the middle line between the two sub-zones. However, it should be underlined that the barrier is not tangible on the line but as a zone as well.

### **2.12.2 Morphology of cities by Russwurm**

Slightly different from the opinion of Pryor and Yunus, especially in areas that lie between the “real urban” and “real rural”, Russwurm suggests three sub-zones: (1) inner fringe; (2) the outer fringe, and (3) urban shadow zone (Yunus, 2000, pp. 167-168). Russwurm also identified regional rural-urban fringe (the term of Pryor).

This structure, based partly on Russwurm (1975b, 1977a) and Bryant (1982), is particularly helpful since it stresses the notion of a continuum between urban area and rural hinterland (Fig. 2.9). As another opinion, the basic problem is the dominance of the introduction of the existing sub-zone. Inner fringe is marked by a number of agriculture land conversions to non-agricultural land. Penetration of land owners rather than farmers happens a great deal in this sub-zone. The outer fringe is the area/sub-zone where village land use is dominant.

Provincial land conversion into urban land happens a great deal, but the frequency is not as high as in sub-zone of inner fringe. Infiltration of urban appearance begins to appear in this zone. In the cities of Western countries, cemeteries and land for stacking carcasses are among the characteristics of the outer fringe areas. This is reasonable because such forms require vast land that is plentiful and cheap. Land ownership is still dominated by farmers. The urban shadow zone is the area where the elements of urban morphology begin to infiltrate, but is still minimal. This zone bordered directly with real urban areas. The distributor of its zone is a conceptual model only. Not all cities are marked by a sequence of sub-zones such as in the model and it not always spread evenly in all directions.

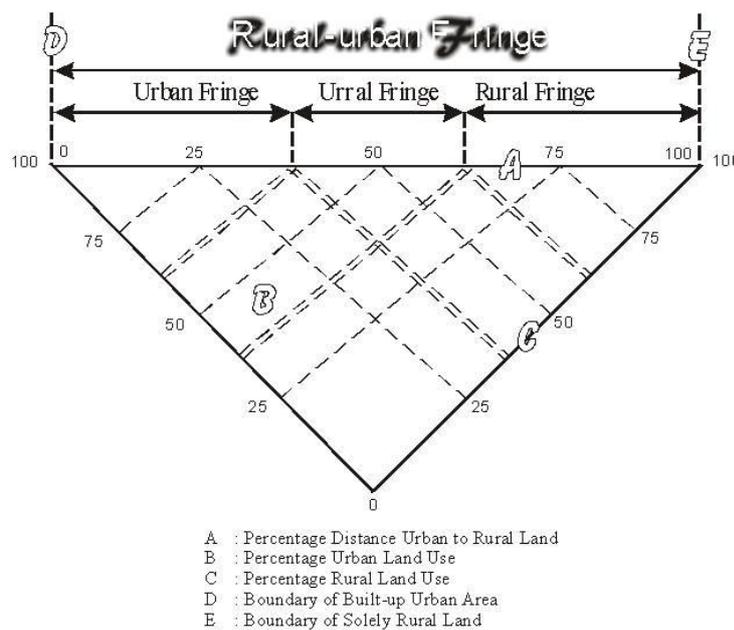


**Figure 2.15** Spatial structure model (Russwurm, 1975)

The structure represented in Figure 2.15, is, of course, an 'idealized' one. The full sequence of types does not occur around all centers or even in all directions. Sometimes an abrupt change may occur in fringe to rural hinterland. On the south bank of the Montreal region, for example, the metropolitan influences are reduced significantly to the south-east of the river (INRS, 1973).

### 2.12.3 Morphology of cities by Yunus

Yunus (2000, pp. 168-169) adds new sub-zones in sub-zone differentiation according to Pryor (1968). They are located between the urban fringe and rural fringe: (1) urban areas; (2) urban fringe; (3) urban-rural fringe; (4) rural fringe, and (5) rural areas. The urban area is the area where the land use is 100 per cent urban-oriented, while the urban fringe is the area (zone) dominated mainly by forms of urban land use (more than 60 per cent of urban land use and less than 40 per cent of rural land use). Urban fringe areas are located from the border point of the urban built-up to within 40 per cent of the point (calculated from the overall distance of a 'real urban' to 'real rural'). Rural fringe is a sub zone of the percentage of its urban land use in balance with its rural land use. The comparison ranges from 40 per cent to 60 per cent where the explanation is more than 40 per cent urban land use and less than 60 per cent of rural land use. In this condition, a zone shows the comparison of urban land use in balance with provincial land and the structural transformation of land use will occur, although it is not as fast in the urban fringe area (Figure 2.16).



**Figure 2.16** Urban-rural land use model (Yunus, 2000)

Provincial land use dominates the sub-zone of the rural-urban fringe, where at least 60 per cent of its land use form is rural. Transformation of land use structure runs more slowly than the sub zone of rural fringe. The rural area is an area which all land use forms are geared towards agricultural land use. The process of structural transformation of the general land-use factors is associated with distance from built-up area, but in areas located along transportation routes and at locations near the junction of the ring road and radial roads, the distant decay principle associated with the acceleration of transformation structure of land-use do not apply.

### 2.13 Characteristics of rural-urban fringe based on morphology of city approach

A city always developed from time to time. The definition of "development" here concerned about aspects of political, social, cultural, technological, economic and physical. Physical development is one particular aspects directly related to the land-use of urban and rural. The existence of "city" can be viewed from various dimensions (Yunus, 1992), so it would need to set out the linkages between various dimensions. "Matra" settlement morphology and legal articulation are two "matras" that the most directly attributable to the expression of urban space. "Matra morphology settlement" highlighted the existence of urban spatial in shape or form and traits or characteristics of the city. Some sources suggested that the review of the morphology of the city emphasized the forms of physical and urban environment. It can be observed from the physical appearance of the city reflected in the existing roads, building blocks such as residential or non residential, commercial/industrial as well as individual buildings (Herbert, 1973). Meanwhile, Smailes (1955) had previously introduced the three elements of urban morphology: (1) the elements of land use; (2) street patterns; (3) building types (land use, street plan/layout, architectural style of buildings and their design). This is the term first appeared "townscape" (Smailes, 1955). Geographers study emphasized more on land use and "plan/layout/town plan" the relationship between the town plan with "building

design" on the one hand and "land use" on the other. Conzen (1962) expressed the same opinion with Smailes (1955) where the component of "townscape" consists of "plan, architectural styles, and land use". Johnson (1981) suggests three different components, namely: (1) the plan of streets, (2) buildings, (3) The functions performed by its streets, and buildings. Here, we see that the elements of land use is not explicitly mentioned, because of "urban land use" itself is essentially a reflection of function rather than buildings and streets that exist in an area. Based on the three elements, the "plan" shows the elements of the most rare subject change, then the second element are architectural style, and the most dynamic element is the "land use".

Two kinds of concept have been developed by Conzen (1960) for the "town plan analysis", namely: (1) "The burgage cycle concept" which every plot development is traced through the stages of "institutive" (began construction of a building), "replitive" (start full of buildings), "climax" (stage not allowed built buildings again), "recessive" (resist deterioration). Basically, each stage illustrated how far the existing buildings affect the respective plots. (2) "The fixation line concept" is the concept of the introduction of the boundaries of the zone characteristics. In this case, Conzen (1960) distinguished between "urban built-up land" and non urban built-up land. Built-up area is a clear line to observe how the acceleration of the appearance of the city outwards. We can find the zone edge (fringe zones) located outside of built-up area that will be the location for urban functions in the future. Meanwhile, this region shows characteristics intermediate between a village and a city especially for modern cities in the Western countries, "fringe zone" has the characteristics of land use include grave, golf courses, and public utilities. According to Conzen (1962), the development of these characteristics indicates congestion while on "urban sprawl". If urban growth continues longer, then the characteristics of the edge is no longer located in the suburbs but will be in the midst of 'built-up land'. However, the characteristics of the edge will remain still visible, can be traced and a component in the use of urban land.

## **2.14 Environmental perspectives of rural-urban fringe**

In much literature on basic science and regional planning emerged various terms that have a common direction and sense of spatial orientation to the urban fringe. Russwurm (1987:21-22) states that the outskirts of urban areas have a wide connotation. The spatial in terms of physical distance, this area covers a radius of about 50 kilometers in a city but in the scope of this territory was divided into several stages. Firstly, the inner fringe areas covering about 10 miles up to 15 miles, which still looks the boundaries of the physical expansion of a city. Secondly, the outer fringe area which includes the expansion area between 25 miles up to 50 miles and ending at an area of shadow city, where 'urban influence' has been relatively diminished. Russwurm not directly stated where the location of pure urban fringe, but from his statement to say that "the area between the" pure lies approximately 15 kilometers up to 25 kilometers radius of a city. Regardless of the precise physical distances that fall into the villages and towns are intended sense, the term threshold area between the village and the city is often mentioned by regional experts in various phrases such as, the edge of town, the urban-rural, urban expansion areas, and others. More information about the character of housing and settlements in the villages and towns are put forward by Koestoer (1997:11); housing in the suburbs and rural settlements close to the town establish a specific pattern in urban fringe areas. At the time of the influence of urban settlements to reach these areas, settlement patterns tend to be more regular than the previous pattern. It is clear as a result of "intervention" of the housing developers in the area at the side of this city. They had

anticipated the development of the city. So, it is not impossible to "land speculators" came in the rural-urban fringe area. Furthermore, the pressure arising from the construction of roads in border cities heavily influenced changes in land use. Thus, rural settlements turned into a mixed pattern. There are parts of the housing are arranged both according to the framework of the new road is formed but in other parts, there is also a fixed pattern as in the past, that is not regular with semi-permanent buildings. In addition, the mushrooming number of industrial development and is located alongside the traditional settlements and new housing. Thus, it is not impossible when chaos occurs, where the number of vehicles in and out of the new residential areas will increase. If road conditions are not yet sufficient, then the traffic jam at the mouth of the entrance to the city occurred quickly than expected. This condition is commonly seen during rush hour morning and afternoon. As mentioned on previous exposure, city dwellers tend to seek alternative shelter to avoid the inconvenience of living in the city, and its region that it is possible settlement in the rural-urban fringe.

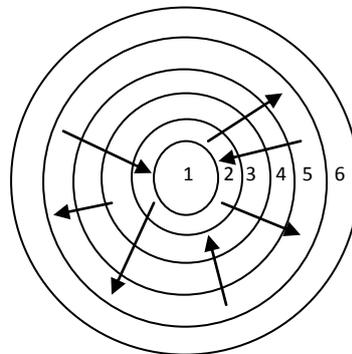
### **2.15 Land use patterns in the rural-urban fringe**

The pattern of land use on the earth's surface reflects the level and orientation of community life in a region. When we talk about land use, there are two questions of principle: (1) Whether the type of activities that exist on the land, (2) where should the space for those fields (Isbandiyah, 1998:44). Population growth and development has changed the dynamics of fertile agricultural land into building land. Residents tend to stay in areas that are fertile, therefore, making roads, schools, industry and other infrastructure had established on the land. Agricultural lands increasingly shifts to marginal areas or forest lands, so the risk of land damage was even greater. Increased population growth and not allow the existing land used as agricultural extension, agricultural land lead to fragmented into small parts. In addition, not all land is owned and controlled by farmers, but there is land that is occupied by "city people". Humans have the freedom to choose the most suitable place and according to him, where it can provide conveniences to meet the needs of his life. Transport and communication is one importance factor to describe the dynamics of human. Both can lead to spatial mobility and ideas, so that insight into the space becomes more widespread, open and "its intensive interaction". According to Daniel Lerner, physical mobility or population movement is the beginning of the process of modernization. Physical mobility is the first step towards human communication, so media communications will be more widely used to generate a series of production. Spatial mobility and mass communication will cause impact on society, both positive effects and negative effects depending on outside influences it receives. These effects would manifest a change in the economic, social, cultural, technology, functions and patterns of land use. The conditions above frequently occur on the outskirts of town where it appears the transformation of spatial and a-spatial. Some experts and urban planners to provide theoretical models that fit the pattern of land use to overcome the problems of "patterns of land use" in the urban fringe, such as Friedman. In essence, Friedman's model is a hierarchical pattern of land use to overcome the gap between rural and urban. The model of land use pattern that may be applied to the suburbs is a form of satellites and scattered. Satellite form is applied among others in Paris, London, Rio de Janeiro, and Hong Kong. This strategy is pursued by a special city for residential, industrial area, or satellite city full of amenities.

Specific cities are surrounded by green belt settlements that have been successfully developed in Western Europe, including London and Paris. Satellite Forms and the new centers, major cities with smaller towns around it will be made to do in such a way that the functional

relationship is more effective and efficient. Form of scattered in the greatest unity and compact morphology found in some urban centers. Each center has a specially function group and different from each other.

In the area of urban fringe can occur a variety of interaction that can be described as follows:



- 1: City
- 2: Suburb
- 3: Inner-fringe
- 4: Urban fringe
- 5: Urban Shadow Zone
- 6: Rural area
- : Centrifugal
- ← : Centripetal

**Figure 2.17** Rural-urban land use triangle (Pryor, 1968)

Pathways described as a picture of the ideal, but in reality, the lines are not concentric, some things that affect:

- The location of shops and commerce.
- The location of the plant; it can be found in three areas, namely: the area on the periphery of the city, trade district, and the area along the street with traffic to transport weight.
- Residential location; spatial distribution of settlements affected by various factors, such as: competition, private ownership, differential desire-ability, topography, transportation, the structure of origin etc.

## 2.16 Rural-urban fringe communities

The existence of communities in the area of rural-urban fringe is the circumstances of the interaction between rural and urban. The interaction between rural and urban areas can occur due to various factors that exist in the villages, towns and between villages and towns. The progress of rural communities, road network expansion in rural-urban, urban integration or influence on the village, the need for reciprocal rural-urban interaction has spurred urban village gradually, and effectively. Lack of progress in the fields of transportation and inter-regional traffic causing insulating properties village gradually reduced. The villages are located close to the city has a lot of influence of the city, so the percentage of villagers who worked as farmers become decrease, they prefer choose jobs that are non-agrarian. Rural areas in the border town which is influenced by the layout of urban life came to be called the urban fringe or suburban areas (Bintarto, 1977:38).

In general, condition of farmers in the rural-urban fringe area is more advanced than farmers in rural area. This is caused by several things, namely:

- Short distance to the city, so the frequency of interaction between citizens of the city with rural residents a bit high. The news through newspapers and radio transistor can reach the rural-urban fringe areas.
- The possibility to get an education for village children in this area is greater than rural areas are located far from the city.
- Opportunity to obtain additional livelihood in the city made possible by the location adjacent to the city (Bintarto, 1977:38).

Developments in the field of infrastructure and transportation facilities have possible symptoms of urbanization in terms of the influence of the city to the village. These developments also affect other areas such as education and trade. The atmosphere of life as mentioned above add to the excitement and spirit of working villagers and urban residents who live in urban fringe periphery. One consequence is the loss of the nature of "mutual assistance" in connection with the opening of rural communities.

Motor vehicles are reaching diverse rural areas. It can increase the frequency of contact and the economy among villages and urban communities. Thus, there is a change in form and the way of life of the village community. Telephone, radio, and television can also increase communication between the developing communities with developed communities. Gas stoves, washing machines, and etc. have been easy for housewives to complete the work at home. There are several facts that the modern production of goods resulting from the transfer of advanced technology has lead to side effects, namely the participation of the ways of life of the transfer of technology. We can examine the changes in society/the characteristics of the village became a city of the signs identifying the town either through physical characteristics and social characteristics.

According to Bintarto (1977), some physical characteristics cities can be shown as follows:

- a. Places to markets and shops; the first time, (1) market is the focus point of a city, (2) market is an open place, where farmers and craftsmen bring their goods and carry out trade in barter or exchange of goods with goods. Further development, the nature of the market changes from open areas into the trade center buildings are a bit much "is closed", only trade in "agricultural products and industrial products". Thus, there was a busy shopping center visited by the buyer. These centers are known as shopping centers. According to Arthur B. Gallion and Simon Eisner (1963), these shopping centers in terms of service can be classified into three categories:
  - i. Neighborhood centers: this place is to serve the population of the city between 7500 persons up to 20,000 persons.
  - ii. Community centers: this place can serve 20,000 persons up to 100,000 persons
  - iii. Regional centers are: this place can serve 100,000 persons up to 250,000 persons
- b. Places to park.
- c. The places for recreation and sports

Social characteristics can be expressed as a follows:

- a. Economic social stratification: differences in educational level and social status can lead to a heterogeneous state. Heterogeneity could continue and trigger a competition.
- b. Individualism: differences in social status, economic or cultural can lead to individualism. Purity of the nature of "mutual assistance" is rarely found in the city.

- c. Social tolerance: busyness of each "citizen" in a high enough to reduce attention to others.

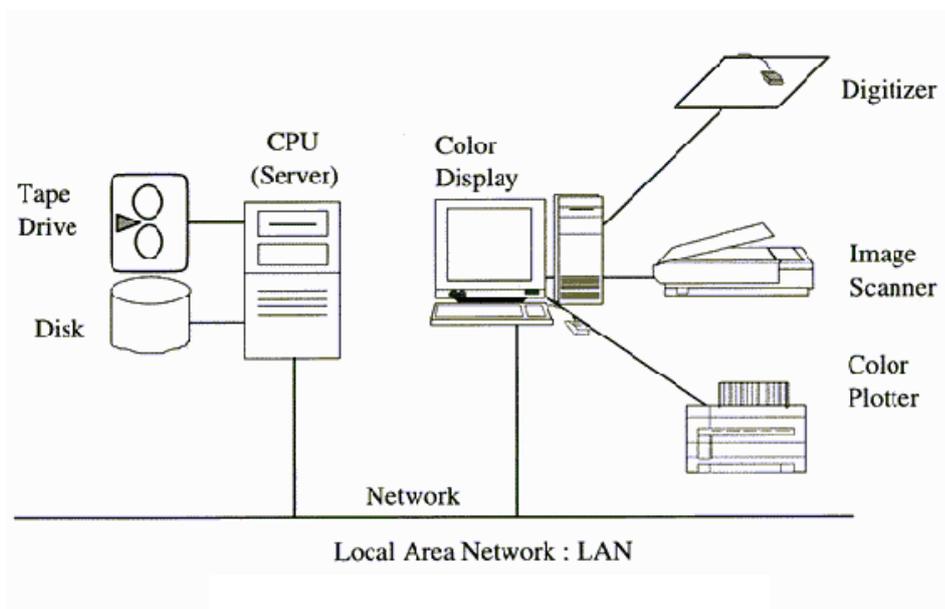
Rural-urban fringe community raised in this research is a group of farmers and come-in population as a characteristic of the rural-urban fringe areas. Farmers are a group with a characteristic countrified with their agricultural land while, come-in population is population group that overflow due to the centripetal force from the city center and the lateral displacement between the rural-urban fringe areas. This is what characterizes the mixing of rural-urban fringe area as study materials in this research.

## 2.17 The role of GIS in spatial

Geographic Information System is a set of tools used for the collection, storage, activation according to the will, transformation and presentation of spatial data from a real phenomenon on the surface of the earth for certain purposes (Burrough, 1986). According to Demers (1997), one of the characteristics of Geographic Information System is a subsystem of manipulation and analysis of data that can serve as a model. In this case, GIS is capable of displaying the results of the process when an input is changed.

According to Shunji Murai (1999), a computer system for GIS is mainly composed of hardware and software. A hardware system is supported by several hardware components, such as:

- **Central Processing Unit (CPU);** CPU executes the programs and controls the operation of all components. Usually a personal computer (PC) or a work station is selected for the required CPU or as a server computer.
- **Memory** divided into:
  - **Main Memory:** essential for the operation of the computer because all data and program must be in main memory for fastest access. More than 64 M bytes are at least necessary for PC based GIS.
  - **Auxiliary Memory:** is used for large permanent or semi-permanent files with slower access. Hard disks, floppy disks, magnetic tapes, or optical compact disks (CD-ROM) are used. At least more than 1 G bytes is required for hard disk in GIS.
  - **Peripherals** divided into:
    - **Input devices:** key board, mouse, digitizers, image scanners, digital cameras, digital photogrammetric workstations etc.
    - **Output devices:** color displays, printers, color plotters, film recorders etc. Figure 2.11 shows an example of components of a GIS hardware system.
- **Software system;** a software system is composed of programs including operating system, compilers and application programs.
  - **Operating System (OS):** controls the operation of the programs as well as all input and output. For PCs: MS-DOS (IBM PCs) and WINDOWS is the dominant OS. For workstations: UNIX and VMS are the dominant OSs.
  - **Compilers:** convert a program written in a computer language to machine code so that CPU can execute binary operation. Commonly used language includes C, Pascal and FORTRAN and BASIC etc.
  - **Application Programs:** Many vendors are providing GIS software systems as listed in Table 2.2.



**Figure 2.18** Components of GIS Hardware System (Shunji Murai, 1999)

**Table 2.2** Several vendors of GIS software (Shunji Murai, 1999)

GIS Software	Vendor	CPU		Data Model		Applications		
		PC	WS	Vector	Raster	Analysis	DTM	Network
ARC/INFO	ESRI	○	○	○	○	○	○	○
	Intergraph		○	○	○	○	○	○
MGE	Generation 5	○	○	○		○	○	○
Geo/SQL	Technology	○						
	IBM	○	○	○	○	○		○
GFIS	Clark Univ.	○			○	○		
IDRISI*	GRASS	○	○		○	○		
GRASS*	Information Center							

Remarks : \* public domain software

In the spatial expression, the use of GIS describes spatial distribution based on input prepared. The relationship between the research of rural-urban fringe with the GIS are as follows: GIS is used to find the location of rural-urban fringe area on the basis of "proportion of land use" and "the distance bands" that have been determined.

### 2.18 Pro and contra in growth management efforts in the rural-urban fringe area

According to B. Kombaitan (1992:55) some policies and settings that are prepared on the growth of suburbs such as large lot zoning and control of local growth through growth management (Chinitz, 1990; Fischel, 1991). Then, the main question is whether this arrangement would lead to urban sprawl conditions is new again, due to excessive decentralization, as summarized by William A. Fischel in 1990, in his study "Do Growth

Controls Matter?." Fischel argues that local growth controls will make home prices go up on the sub-region affected by the restriction, so that developers will get out to the orange groves and cornfield rather than toward the downtown skyscrapers. Richard B. Peiser (1989) argues that actually happened discontinuous development will eventually result in higher-density development. Thus, was born the new term "Leapfrog-then-infill" development as the equivalent of "Leapfrog-with-infill" which was introduced by Edwin Mills and Bruce Hamilton in 1989. They concluded that "the pattern of development" is to prevent sprawl. George Lefcoe (1990) supports the opinion of the fault prediction's Fischel accommodate the capacity of the population by the planner when setting the restrictions.

Pro and contra related to control the growth of rural-urban fringe areas is how effectively a concept is applied for prevention of urban sprawl. The concept generated in the research of rural-urban fringe should be fully in accordance with the characteristics of the study area.

## 2.19 Constraints and strategies for rural-urban fringe area

According to Tom Daniels (1999:79-84) there are eight things that become constraints in planning and managing growth in fringe areas, namely:

- Government, authority, and special areas of overlapping and fragmented.
- Fringe areas are wide.
- Lack of vision from the community, county, or regional.
- Lack of understanding of place and identity.
- Immigrants, social conflict, and rapid population growth.
- New growth is widespread and sporadic.
- Too little resources in the field of planning.
- Mechanical determination of the designation and planning approaches that is out of date.

While, the strategy relating to issues in the rural-urban fringe areas are growth management and legal approaches. The grouping strategy is proposed to be three, namely:

1. ***The Pro Growth Strategy:*** The existence of the transfer of fringe area communities became more like the urban lifestyle. In fact, the fringe area is essentially a land bank for urban growth.
2. ***The Balanced Growth Strategy:*** This strategy makes the target for some areas that have been inhabited for growth/development and protect some other areas. The choice is not between growth and rescue of the environment, but how to manage growth, so that the environment remains a more attractive and have the economic value.
3. ***The No Growth or Very Slow Growth Strategy:*** This strategy to change community into a boundary, making development and the change difficult and expensive.

From the three strategies, this study chosen the concept of "The Balanced Growth Strategy" is intended as the growth management so that the environment continues to be attractive and have the economic value.

## 2.20 The concepts of rural-urban fringe area

Yunus (1997) suggested that in general, the development planning techniques from the urban fringe area for aspects of land use can be grouped into two categories. The first category is

more directed at the interests of urban areas (urban-oriented technique), and the second is more directed at the interests of rural areas (rural-oriented technique).

### 2.20.1 Urban oriented technique

The main objective of this technique similar with the rural-oriented techniques but the difference is only review the more urban-oriented. The effort made is to create an ideal life in view of the urban population. Attempt to create a comfortable atmosphere of this life by adding new urban land. Since, space is already felt no longer able to accommodate population, and urban functions that exist. If this is enforced, the environmental degradation that will occur because of the major focus is the countryside, the land control efforts that were targeted. Technique to be discussed is a new technique that has not been widely applied in developing countries. This technique deliberately offered to become food for thought which then becomes a consideration for policy-making. In general, there are seven kinds of techniques with the aim of controlling the growth of uncontrolled land in urban fringe areas, selected for this study is four techniques with consideration of compliance with the study area (Isber, G., 1975; Fischman, R., 1975; Brower, D.J.), namely:

1. Extra Territorial Zoning
2. Planned Unit Development
3. Utility Extension Policy
4. Development Moratoria

**Extra Territorial Zoning:** As we all know that, the built up areas is not always within the administrative boundaries. If the built up area is outside the administrative boundaries of the city, it will cause various problems especially the development of physical territory. Juridical-administrative, the built-up areas that are outside the boundaries of the city administration, directly into the authority of another government to regulate/manage its development. The city government has no authority to do so, although the physical problems, social, economic, and cultural and relate more to do with the economy urban areas. From here, it began to arise some problems in the spatial planning. There is no planning synchronization between the City Government, on the one hand, with the government outside the city where the built up areas are located. This leads to spatial planning will be spend energy and cost. In fact, it is not impossible to have a negative impact on the lives of urban and rural areas. This technique is an authority for zoning given to the city government to regulate the built up areas that located outside the boundaries of the city government. The main consideration is to avoid policy contradictions harmony between city government and outside the city government is well to remember that all aspects of life built up is clearly closer to existing urban life. Good cooperation between the government and outside city government is necessary. Without the full support of outside the city government the other, then, the application and adoption of this technique will not work.

**Planned Unit Development:** This technique is more oriented to the unified site design for a typical group of such as designation to the construction according to the university campus, development planning recreation center with all amenities until the development of a new city. Lamont (1979) describes the use of this technique in three kinds of unique properties, namely:

1. "Planned Unit Development" is usually applied to scale development large from the building of the campus/university or specified education until the establishment of new towns.

2. Therefore, included regional development quite broad, in inside covered a variety of building scale.
3. The total area of lead managed development implemented can not be done within a relatively short time. In other words, can be disclosed that, in it there is a stage by stage development in a long time to allow the review of the plans had been formulated earlier, due to changes in requirements, technology, financing or perhaps the concepts used.

**Utility Extension Policy:** The impacts of uncontrolled growth of the city toward the government are public facilities. Ribbon and leapfrog are two patterns that are difficult for the procurement of the facilities required for urban life, especially in terms of efficiency and effectiveness. In essence, this technique will stimulate physical development in areas that had been planned to become a new growth area, but this technique will serve as a "brake" for the rapid physical development in areas that are not desired.

Acceleration can be run by building public facilities in the desired areas and facilitate every effort to establish a physical building in the area concerned. In contrast, for areas that did not want to be banned for specified public facilities. Although there is no building prohibition, but with the prohibition network development facilities, the retardation of physical growth can be done effectively.

One thing that should be aware is that the technique was not anti-development techniques, but techniques to establish the physical layout in accordance with what is desired.

**Development Moratoria:** This technique is intended to slow or stop the physical development of cities in certain areas. By itself, this is stipulated in legislation or local regulations that clearly and decisively. Consideration of, why the application of this technique worked variously. However, a mature consideration and assure that there would be a negative impact on the environment used as the main base.

This technique is blocking progress in certain places that are considered as "key points" for a certain period. According to Rivkin (1975) application of this technique to form a joint variation of these things below and fully disclosed as follows:

*"The application of moratoria can take many forms and consists of a combination of ten policies. These policies are (1) a freeze on new sewer authorizations (extension of trunk lines into currently un-serviced areas); (2) a freeze on new sewer connections (the tactical hook-up of buildings to an existing trunk of feeder line); (3) a freeze on the issuance of new building permits; (4) a freeze on re-zonings or zonings to higher-than-presently developed densities; (5) a freeze on the approval of subdivision requests; (6) a slowing down or quota allocation for any or all the above within an affected area; (7) a freeze on water facilities extensions; (8) a freeze on water hook-ups to existing facilities; (9) a freeze on natural gas line connections; and (10) a freeze on curbing construction".*

By comparing the situation in Indonesia, it is necessary adjustments so that the application of these techniques if deemed necessary in order to show meaningful results. For example, the prohibition on linking "the installation of gas pipeline" for Western countries is a sad thing, but to Indonesia, in addition to any benefits yet, there are also yet to be felt. So these things that needs to be thought to be formulated. The important-thing to understand in an effort to transfer this technology is its ideas. As, the transfer of technology in other fields too, if we blindly take over the technology that originated from Western countries, then it is applied in

Indonesia, then to disappointment was the one who will appear. This is reasonable because the background of political, economic, social, cultural and technological level itself is different.

### 2.20.2 Rural oriented technique

Urban Oriented Technique is clearly incriminating urban life without having to consider whether their ways have a negative impact on the agricultural sector or not. On the other hand, Rural Oriented Techniques tend to side with the agricultural sector.

In general, the techniques in this category can be grouped into three kinds of mechanisms: (1) Financial Compensation Mechanism, (2) Police Power Mechanism; and (3) Comprehensive Mechanism (Coughlin and Associates, 1981).

***Financial Compensation Mechanism (FCM):*** The program is planned to provide financial benefits to owners of agricultural land to retain its shape land use. The financial benefits can be obtained direct or indirect. With the willingness of landowners to maintain land use in agriculture, that means hinder the speed of land use change itself. This program has two kinds of techniques in inside. The first technique referred to as Tax Policies. Tax Policies technique provides immediate benefits for land owners in taxation. The first wisdom associated with determining the amount of tax on the basis of its use value. As has been discussed on the front of the Urban-Oriented Techniques, particularly regarding the Tax Abatement Laws Deferral and then for those owners who still maintain the form of land use in urban fringe areas in agricultural use, proposed use its value only. For those who have changed the agricultural lands into non-agriculture, the amount of tax is determined on the basis of market value rather than land. Wisdom of the second can be cut in specified amount for land owners who still maintain the shape of land use in agriculture. Regarding how long the land owners will still survive to set forth in the agreement or not. The agreement can be followed by specified sanctions or with soft terms. This needs to be formulated in such a way because, in essence, the government has reduced taxation in terms of revenue if the exemption is being implemented. Wisdom of the first and the second above included into what is referred to as the Use Value Property Taxation and Property Tax Credits. The second approach in Tax Policies is Property Tax Credits. If the U.P.V. Taxation, government levies a tax on the basis of its use value only, then in this second approach (Property Tax Credits), government seems to give credit is cut in a certain amount. Point to consider is the existence of rights and obligations that must be met by the owner of the land. If the agreement specified that during specified period the owner will retain its land in some form, and in fact later, the owner denied the agreement then all the intangible tax payable on the discount must be repaid by the land owner and may still be added several other charges including in the determination of the tax. The third wisdom is "the Inheritance Tax Relief". The emphasis is slightly different with the two previous techniques even though the same soul. In this third policy, assistance/financial advantage over extended again until the next owner. The financial benefits can be a "use value property taxation" or "Property Taxation". During, the next owner is still willing to defend his land into agricultural land-use forms, during the same financial benefits can be received. Increasing number of financial benefits in addition, to the two kinds of benefits above, it creates other benefits for owners of land in accordance with current social, economic, and local culture.

The second technique is the Financial Compensation Mechanism: the transfer of development rights. The idea of this technique is an effort to provide certain compensation to the

landowners as a result, are not allowed owners to build certain buildings on his land. Area where the land is located will be maintained like a preservation area.

In America, the issue of zoning has been running such a way, then in a different zoning can occur any sale and purchase transactions on the Right to Development. In this case, the protected areas (land owners who are on protected areas) can sell the rights to build in areas that have been designated (Schnidman, 1975).

***Police Power Mechanism (PPM):*** The program is to apply the power of law over a certain area on the outskirts of what is acceptable and what is not allowed by the land owner. With consideration for the public interest, a region can be determined to remain as green belt or retained in the form of agricultural land. Violation of this provision by itself would lead to certain sanctions. This program consists of two kinds of techniques. The first technique is called the Agricultural Zoning is an area on the outskirts of the city that serves as an agricultural zone. The presence of other buildings that had nothing to do with agricultural activities and do not support the activities and development of agriculture in these areas is prohibited. Particular considerations underlying the technique of Agricultural Zoning, among others because the area is a highly productivity agriculture and the threat of conversion of agricultural lands into non agricultural land is large enough.

The second technique referred to as the Provincial Police Power. Mechanism of action's planning to walk in two-way channel. Both top-down and bottom-up walk in balance, but the authority to approve the proposed plan is at a higher level of government. Higher government responsible for formulating the outline plans. In contrast, levels of government under charge of translating the local plans. In addition, the proposals formulated by lower levels of government can also be submitted at the higher levels of government.

The strength of the Provincial Police Power is the right of veto which does not approve proposals put forward by the lower level. Application of this technique in Indonesia is still a bit difficult to reach the real target, namely the protection of agricultural lands due to the mechanism of planning in Indonesia is not as tight as in Western countries.

***Comprehensive Mechanism (CM):*** If the two previous mechanisms (the Financial Mechanism and the Police Power Compensation Mechanism) application is intended solely for the local community only, then this latest program does not purely target the local community but also sectors of the others in development activities at large. In the FCM and the PPM itself are a reaction to problems of land use is urgent to solve. Therefore, comprehensive mechanism in a broader range of targets, then the application must consider the policy that has been formulated by the sector's development of others.

This mechanism has two main techniques, namely the Integrated Provincial /State Program and the Agricultural Districting (Furuseth and Pierce, 1982). The Integrated Provincial Programs implemented in provincial level while the State Integrated Programme implemented in the state level. The levels are extensive, long-term policies formulated to protect agricultural lands. Regarding the selection of regional locations choose to become preservation area largely determined by local governments. This is reasonable because the local governments who are most knowledgeable about the potential of the region locally. In this case, the government entered into integration with the wisdom that has been formulated in the above scale and consequently would receive specific assistance from provincial or central level to be given to owners of land included in the preservation area. In addition, local

governments usually provide certain conveniences in the area. The advantages obtained by the land owner can be either the Use Value Property Taxation, and in obtaining fertilizer, seeds, pesticides, extension, and etc. The participation of the blocks in this program may be something that is mandatory but can also be voluntary. For example, an application program from Oregon as illustrated Coughlin (1981) as follows:

*“The government regulations state that all class I, II, III, and IV soil capabilities can not be committed to nonfarm uses and must be zoned for agricultural uses according to general criteria that has been set by the state. Furthermore, cities must establish urban growth boundaries, within which new development must be contained and encouraged. Public facilities will be provided only in the areas within those boundaries”.*

According to Keene (1981), Agricultural Districting is proposing certain agricultural areas into agricultural areas in the long term. As in the protection of other agricultural lands, the land owners will receive "certain benefits" either financially or not. The main difference in "Provincial Integrated Program" is it's not mandatory, although the Integrated Provincial/State Programs can also be voluntary. Besides, the idea is the inclusion of the Agricultural Districting landowners, while the Integrated Provincial Program is a local government. In these areas, usually occur organizations specializing in agriculture for increase the productivity.

## **2.21 Settlements, real estate, and real property**

The house as a residence is an important part of human life. Doxiadis (1971) and Sumiarto (1993) mention that the era as 'primitive phase' which 'non agrarian'. Doxiadis (1971) characterizes that, at that time humans have not been transforming the earth, and settled temporarily. Place of living was utilize of what is available in nature, such as caves and trees.

There are several definitions of residential, such as 'Undang-Undang' no. 4/1992 on residential and settlements: Residential is a group house that serves as a neighborhood or residential environment, which is equipped with infrastructure and environmental facilities. The instructions in the planning of the urban housing area (Department of Public Works, 1987), residential environment are a group of houses with infrastructure and environmental facilities.

According to Jeffrey D. Fisher (1991:54), real estate is a plot of land identified, including support facilities (improvements). Real property is the interest, benefits and privileges attached to any real estate because of the ownership. Real property consists of the rights that have the value or power legally and consists of three components, namely: land, objects that are permanently attached to the land, and legal issues inherent in the land, which can't be transferred by law.

In fact, Indonesian People's considers real estate and real property are two things in common but theoretically two things are different. Real property is the ownership of a property, while real estate is a plot of land or object that is attached on it.

### **2.21.1 The house as primary needs for human**

In accordance with the instructions in the planning of the urban housing areas (Department of Public Works, 1987, p.34), a residential area must meet the several requirements as follows: accessibility, compatibility, flexibility, and ecology.

The people have always tried to utilize the space around it for the benefit of survival. The purpose of housing development is to meet the demand for dwelling as one of the basic needs for humans. In addition, the house is a place of shelter and a rest as well as a place for residents in their daily activities. The requirements related to housing development purposes, namely that every person can occupy a healthy housing, to support the continuation and improvement of its social welfare.

### 2.21.2 The provision of housing development

According to the three ministerial decision no. 648-348/1992, no. 739/KPTS/1992, and no. 09/KPTS/1992 that the development of housing and settlements are directed to realize the area and residential neighborhoods and settlements with a balanced residential environment, including a simple house, middle house, and a mansion by comparison and certain criteria. It is intended to accommodate harmoniously between groups of people from various professions, levels of economic and social status.

Specific comparisons referred to above is the ratio of the number of the simple house, medium house, and mansion, at 6 or more, 3 or more, and 1. For example, the construction of medium house as many as 900 units or more at each location are required to build two units of the simple house for every 1 unit of medium house which can be built at another location but remained in the same city. The construction of 100 units or more mansion at any location required to build simply house of 6 units per 1 mansion and required to build middle houses of 3 units in others location.

The certain criteria in the construction of housing as referred to the above are as follows:

- Simple house is a house built with a land area between 54 m<sup>2</sup> to 200 m<sup>2</sup>, and construction's cost per m<sup>2</sup> does not exceed the unit price per meter highest for the construction of C-class government housing agencies regulations.
- Middle house is a house built with an area of land between 200 m<sup>2</sup> to 600 m<sup>2</sup> with a construction cost per m<sup>2</sup> among the highest unit price per m<sup>2</sup> for the residential development of government agencies class C to class A will apply.
- Luxury house is a house built with an area of land between 600 m<sup>2</sup> to 2000 m<sup>2</sup> with a construction cost per m<sup>2</sup> over the highest unit price per m<sup>2</sup> for the residential development of government agencies class A will apply.

### 2.21.3 Factors that affect property values

Factors that influence the value of a property are as follows:

**Location:** The value of a property is determined from the location of the property (Hodgkins, 1982:74). Then, the strategic location of the property that the product will be more attractive the interest of consumers (Wurtzebach and Miles, 1994:10). This related to accessibility or distance possible achievement of the region and to the region which can provide a convenience for residents. The strategic location will ensure safe and profitable investment.

Check also the whether the location is safe of the road widening, construction of public facilities and others. The lay of the land which height is lower of the road should be avoided.

**Physical:** Several basic physical characteristics of land to be considered are as follows: size, shape, frontage, width, depth, topography, and other attributes such as drainage, pollution, climate and view.

**Environment:** Environment is a system which is the unity of space with all the objects, power, and circumstances (Soerjani, 1987). Environment is the climate, topography, transportation systems, and location factors that affect the value of a property (Fisher, Martin, and Mosbaugh, 1991).

## 2.22 City centre

There is considerable confusion about terms used to describe urbanization, especially the term *city*.

- **The City as a Municipality or Local Authority Area:** The term *city* might be simply the historical core municipality (local authority area), such as the city of Chicago or the ville de Paris or any other municipality. Thus, a metropolitan area or an urban area generally has many municipalities or cities. The Paris metropolitan area has 1,300 cities, the New York metropolitan area more than 700 cities and the St. Louis metropolitan area nearly 400 cities. There are few major metropolitan areas in the world that do not contain multiple cities. *Only one urban area with more than 1,000,000 population in Western Europe, the United States, Japan, Canada, Australia or New Zealand has a single municipal government (Auckland, New Zealand).* The term *city* is principally used in the United States, the United Kingdom and Canada to denote a municipality, rather than an urban area or a metropolitan area.
- **The City as a Metropolitan Area:** The term *city* is also sometimes used to describe an entire labor market, which includes the historical core municipality, continuously developed suburbs and exurbs, which are not connected by continuous development to the urban area or agglomeration. The term *city* is most often used in Australia and New Zealand to denote a metropolitan area or an urban area, rather than a municipality or a local authority (see “Metropolitan Area” below).
- **The City as an Urban Area:** The term *city* is also sometimes used to describe an urban area, which is an area of continuous urban development (or an agglomeration or urban footprint). An urban area includes the historical core municipality, and the adjacent suburbs, but not the exurbs, which are not connected by continuous development to the urban area (see “Urban Area” below).
- **The City in China:** Chinese cities (as the word is translated) are provincial level, sub-provincial level or prefectural level and, as a result, are significantly different than the definitions above.

As used generally on Demographia websites,<sup>1</sup> urban terms are defined as follows:

- **City** generally means a municipality, which would typically have locally elected administration, such as a city council and a mayor. In some cases a city can *also* be a higher-level region, such as the ville de Paris, which is also a department; San Francisco, which is also a county; the city of Shanghai, which is also a provincial level administrative district, the city of Vienna, which is also a state, the city of Berlin, which is also a lander, the city of Mumbai, which is also a region. In each of these cases, there is a

single municipality, though there may be divisions of the municipality that have varying degrees of control over local functions (such as the arrondissements of Paris, the municipalities of Berlin or the wards of Mumbai)

- **Central City:** The central city or core city is the municipality in an urban area or metropolitan area that emerged historically as the most prominent in the urban area. Almost without exception, the name of the core city is also shared with the urban area and the metropolitan area.
- **The Urban Core:** Generally the urban core or the *inner city* is in the central city. Sometimes the urban core includes adjacent municipalities that developed during the same period as the core city. For example, Frederiksburg is a part of the core of the Copenhagen urban area, L'Hospitalet is a part of the core of the Barcelona urban area, and Cambridge is a part of the core of the Boston urban area core.
- **Suburb:** Collectively, the *suburbs* are all of the continuous urbanization that extends beyond the core city (all of the urban area except the historical core municipality and other adjacent historical municipalities). A specific suburb can be an individual municipality or community in the suburbs. For example, the cities of Evanston and Oak Park are suburbs of Chicago. In the London area, municipalities that are outside the Greater London Authority, but inside the greenbelt are suburbs, such as Epsom and Ottershaw (the London urban area is within the green belt).
- **Exurban:** Exurban refers to non-rural development that is within a metropolitan area, but outside the urban area. There are two types of exurban development:
  - ✓ **Exurb:** An *exurb* is a municipality (or a community) or urban area in a metropolitan area that is separated by rural territory from the principal urban area. For example, DeKalb and Kankakee are exurbs of Chicago. The urban areas that are within the London metropolitan area, but outside the greenbelt, are exurbs, such as St. Albans and Milton Keynes.
  - ✓ **Low Density Exurban Development:** Low density exurban development is generally large lot residential development that is not of sufficient density to be considered urban and is not agricultural.
- **Urban Area** means an area of continuous urban development. An urban area will virtually never be the same as a municipality. Usually it will include many municipalities, though in the case of many geographically large municipalities, such as Anchorage or Shanghai, the urban area will be smaller than the core city. The Chicago urban area (population over 8,000,000) includes the city of Chicago and many other cities. An urban area might be thought of as defined by the lights seen from an airplane on a clear night. Some nations formally designate urban areas, which are called “urbanized areas” in the United States, “unites urbaines” in France, urban areas in the United Kingdom and Canada, “urban centers” in Australia and “urban agglomerations” in India. An urban area is also an *agglomeration*. A *conurbation* is an urban area that forms when two or more urban areas grow together, as has occurred in Osaka-Kobe-Kyoto, Essen-Dusseldorf (the “Rhine-Ruhr-Wupper”), Katowice-Gliwice (Poland), or the Washington and Baltimore urban areas, which are converging into a single urban area. Demographia has developed the only comprehensive list of world urban areas over 500,000 population with land area and densities.<sup>2</sup>
- **Metropolitan area** means a labor market, or the area from which the urban area draws its employees. For example, the Chicago metropolitan area (population nearly 10 million) includes the city of Chicago, the Chicago urban area, and adjacent rural areas from which many people travel to work in the urban area. A metropolitan area will nearly always be larger than the urban area, because urban areas routinely draw a large number of workers from surrounding rural territory. A metropolitan area may include more than one urban

area. For example, the Washington urban area and the Baltimore urban area are in the Washington-Baltimore metropolitan area, while the Los Angeles metropolitan area includes a number of urban areas, such as Los Angeles, Riverside-San Bernardino, Mission Viejo, Santa Clarita, Simi Valley, Oxnard-Ventura, and Palm Springs. The United States designates consolidated metropolitan areas, which are routinely used where they exist, as opposed to their metropolitan statistical area (MSA) components. A metropolitan area will usually include many cities, but, as noted above, in rare cases the core city may be larger than the metropolitan area. Many nations, such as the United States, France, Brazil, India, Argentina, and Canada formally designate metropolitan areas.

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## CHAPTER 3 RESEARCH METHOD

This research is used combination between square grid and distance bands, using GIS (ArcGIS 9.3), ArcMAP, and the size of grid is 200 meters x 200 meters to examine the location of rural-urban fringe area. It also used combination quantitative and qualitative methods to identify physical and characteristic changes, patterns of space utilization and causative factor that change the spatial pattern in the rural-urban fringe area.

Secondary data is used in this study include the physical data, demographic data such as the study area population, housing data, administration data and other supporting data. From the secondary data will be known to the rate of building, land use changes, changes in building functions, population-rate such as come-in population and indigenous people, and changes in income levels of the population that has a home-business. The primary data required in this research will be obtained by conducting a field survey to find out how the influence of fringe-settlements to physical changes in the rural-urban fringe. Also by using a questionnaire to gather information from the respondents. Primary and secondary data were analyzed quantitatively using frequency analysis and cross tabulation. This analysis aims to determine how the relationship or the influence of each variable against another variable. It also aims to determine the effect of fringe-settlements development to physical changes and the spatial pattern changes due to the existence of fringe-settlement development in the rural-urban fringe.

### 3.1 Type of research

This research is one of descriptive research. Descriptive research aims to solve problems in a systematic and factual about the facts and nature of populations based on these data, the presentation of data followed by analysis and interpretation (Achmadi, Narbuko, 2002:44).

### 3.2 Variable

The research variables are presented in the following table:

Table 3.1 Research Variable

Indicator	Variable	Value	Technique
<b>A. Physic</b>			
1. Land	- Land use ✓Yard ✓Paddy field ✓Moor ✓Dry land ✓Other	M <sup>2</sup>	Overlapping
	- Cost of land	Rupiah	Chi Square, Cross-tabulation

To be continue

Continue of Table 3.1

Indicator	Variable	Value	Technique
2. Building	- Building area	M <sup>2</sup>	Chi Square, Cross-tabulation
	- Building function	M <sup>2</sup>	
	✓ residential		
	✓ home-business		
	✓ business only		
	✓ office		
✓ other			
	- Layout	Good, Not-good	
	- Shape of building	Good, Not-good	
3. Infrastructure	- Condition of neighborhood road		Overlapping
	✓ Wide	M	Chi Square, Cross-tabulation
	✓ Construction	Technical, Non-technical	
4. Utility and home environment	- Source of water	PDAM, Well/Non-PDAM	Chi Square, Cross-tabulation
	- Quality of water	Good, Medium, Bad	
	- Level of electricity	Volt Ampere/Watt	
	- Waste services	Good, Medium, Bad	
	- Health environment	Good, Medium, Bad	
<b>B. Characteristic</b>			
1. Population growth	- Population	Person	Analysis of population growth
	✓ farmer population		
2. Agricultural-land reduction	✓ come-in population		
	Agricultural-land	Hectare per year	Analysis of agricultural-land reduction
3. Additional of residential-land	Residential-land	Hectare per year	Analysis of additional of residential-land
4. Additional of non-agriculture land and residential land	Non-agriculture-land and residential land	Hectare per year	Analysis of additional of non-agriculture land and residential-land
5. Acceleration urban sprawl	Agricultural-land Agricultural-land reduction	Hectare	Analysis of acceleration of urban sprawl
6. Housing acquisition	Housing acquisition Inheritance Buy so Build their own	Person	Questionnaire
7. Farmer's commitment	Farmer	Person	Questionnaire

### 3.3 Materials of research

In this study, the object of research is the land use in the rural-urban fringe area, changes in land use, changes in building function, and changes in infrastructure (condition of neighborhood road, waste service system, electricity power, and sources of water) before and after the development of fringe-settlements. The unit of analysis is the owner of home-business, the physical of home business, farmers, come-in population who live in fringe-settlement and the surrounding environment (other facilities that support). Furthermore, the respondents are business owners and farmers. Only come-in population who live in the area of research only.

### 3.4 Study approach

According to Yunus (1997), in reviewing the characteristics of the development of an urban fringe area of study there are two approaches, namely:

1. **Physical Morphology Approach:** This approach aims to understand the processes and patterns of change in physical appearance "urban" in urban fringe areas. There are two kinds of processes and patterns in this approach are:
  - a. Analysis of the physical appearance of the development of "urban" is done by obtaining information from a map from time to time. Then, from the comparison of these maps can be obtained directions and trends and patterns of urban fringe area development process. Included in this approach is the analysis of pattern formation of the building.
  - b. Analysis of the process of land use change in urban fringe areas. The existence of gradations of the nature of urban and countrified in urban fringe areas can also be identified on the use of land. Discussion of land use is limited to agricultural land (rice fields and moor) as a representation of countrified elements and non-agricultural (non-settlement and settlement in addition to agriculture) as a representation of countrified elements to clarify the observations. By comparing the data for 10 years, then it can be obtained pattern of development (reduction and increase in its spatial structure). Morphology physical approach consisting of descriptive analysis of patterns of farmland reduction, the addition of land settlement patterns, and patterns of settlement except the addition of non-agriculture land.
2. **Behavior Approach:** Gradation properties of urban and countrified in urban fringe areas can also be identified on the attitude towards land. The development process of the urban fringe area reflected the extent of population's commitment to land conversion. Behavioral approach aims to understand people's behavior in terms of commitment of farmers to their agricultural land and commitment of farmers to their agricultural activities.

### 3.5 Research framework

The research framework of the dissertation can be seen in the flow chart bellows:

**Chapter-1**

**Background**

- City center is insufficient for urban population
- Migration and congestion increases due to additional traffic volume
- Agricultural-land conversion in rural-urban fringe area
- Mixed land use, social and demographic characteristics, lying between the continuously built-up urban and sub-urban areas of the central city and the rural hinterland.



**Problem determination**

- Where is the location of rural-urban fringe area?
- How does the physical change of rural-urban fringe area?
- How does the characteristic change of rural-urban fringe area?
- What are the strategies of rural-urban fringe area to anticipate urban /regional development?



**Objectives of the research**

**The main purpose** of this research is to improve the policy of rural-urban planning related to urban development in rural-urban fringe area. Thus, **the objective** divided into several goals, namely:

1. to identify and examine the location of rural-urban fringe area based on combination model
2. to identify the physical and social-economical change of rural-urban fringe area
3. to identify the characteristics change of rural-urban fringe area, and
4. to examine an appropriate concept and strategy to anticipate urban development in the rural-urban fringe area

**References**

**Chapter-2**

**Land-use of 4 sub-district**

- Blimbing
- Lowokwaru
- Sukun
- Kedungkandang

**Identification: location of rural-urban fringe**

Observation (GIS): Spreading of building map, spreading of agriculture-land map, land-use map)

**Criteria**

**Urban-rural land use model**  
(Pryor, 1968; Yunus, 2000)

**Spatial structure model**  
(Ruswurm, 1975)

**Proposed new model**  
(Agustin and Kubota, 2010)

**Evaluation**

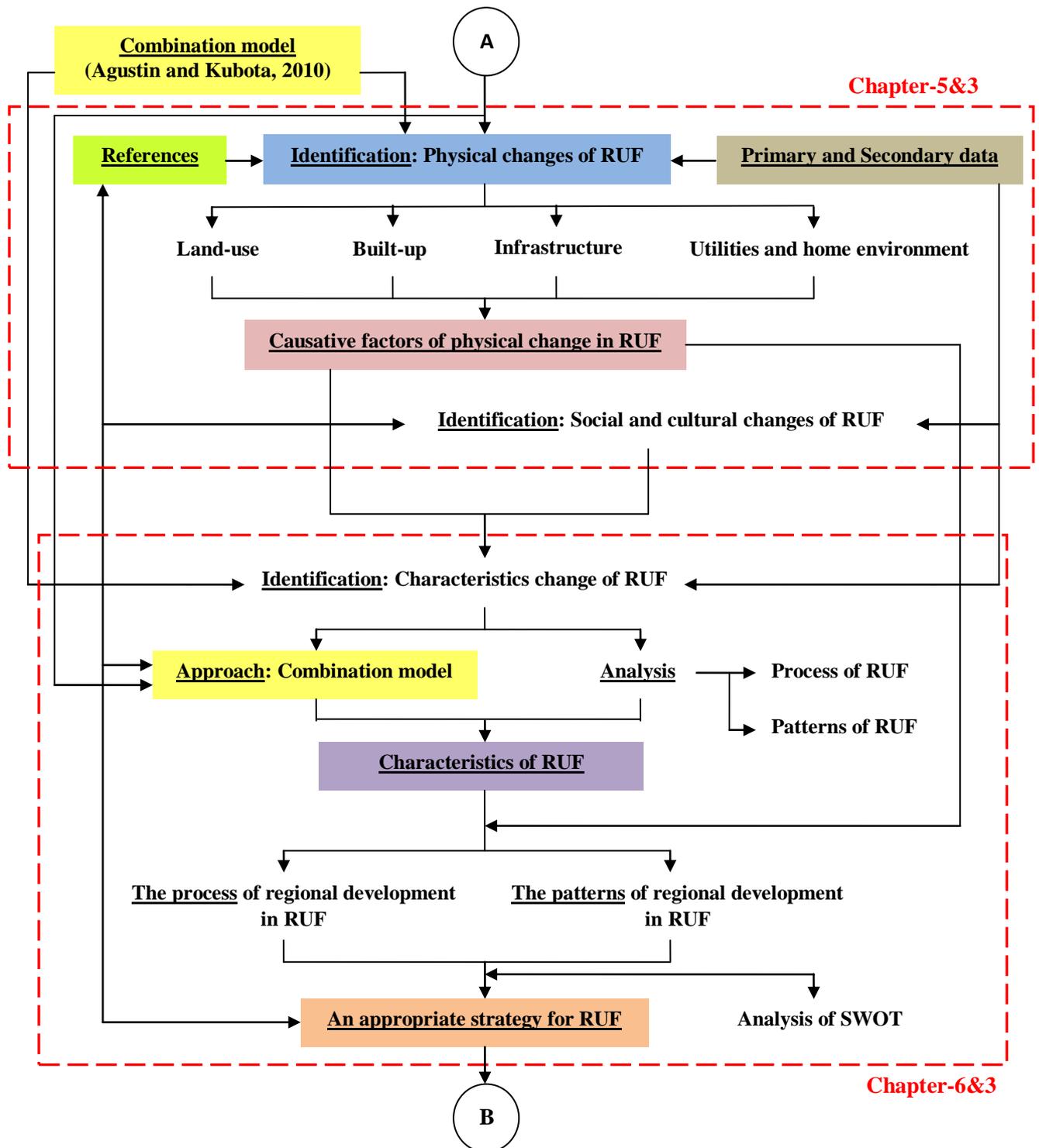
**Reality real land-use**

**Sensitivity change**

**An appropriate model for RUF**

**Chapter-4&3**

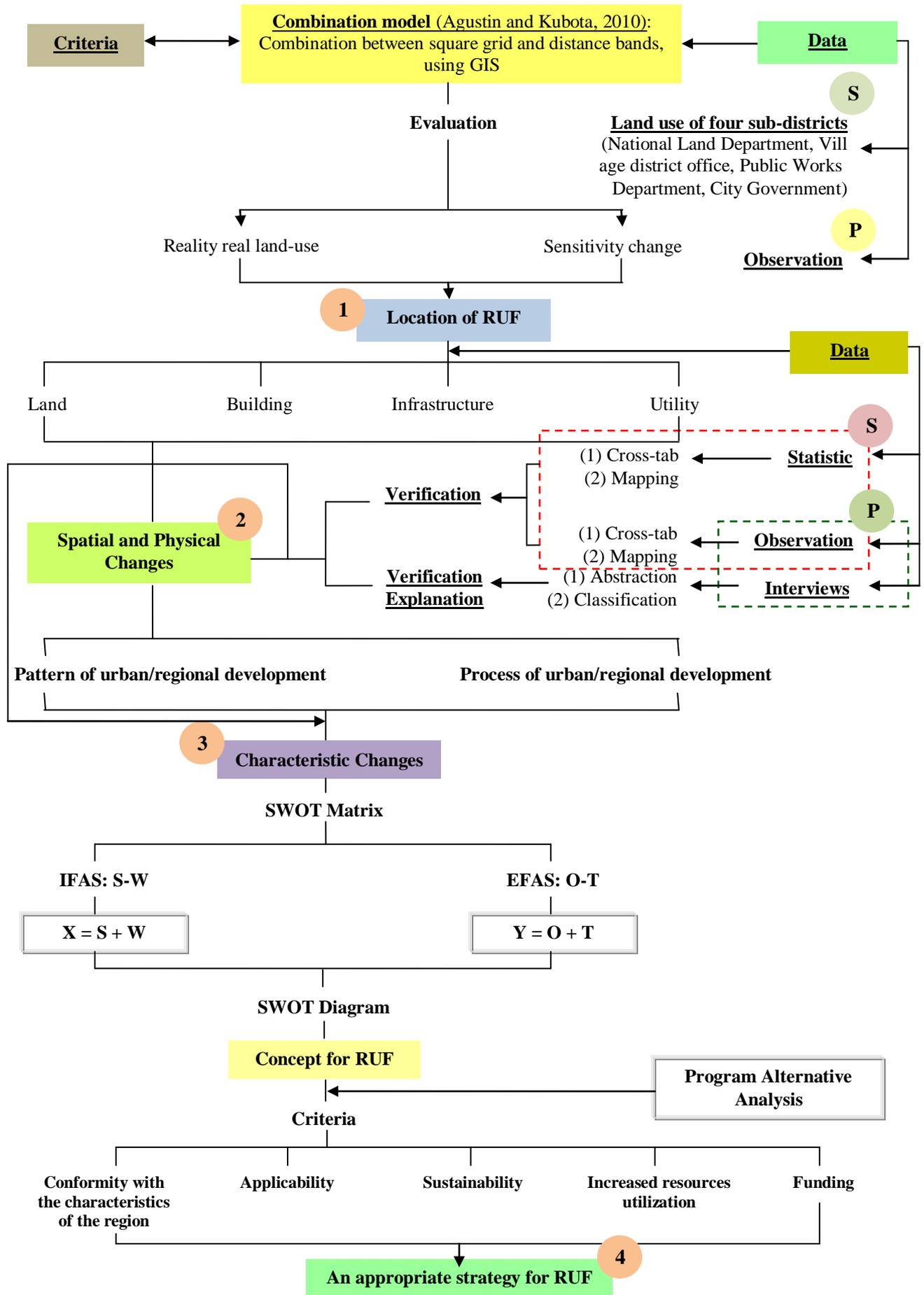
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This research is divided into four analysis schemes as follows:

1. analysis scheme of rural-urban fringe area location,
2. analysis scheme of physical changes of rural-urban fringe,
3. analysis scheme of characteristic changes of rural-urban fringe,
4. analysis scheme of an appropriate concept and strategy to anticipate urban/regional development in the rural-urban fringe area

Analysis scheme of the research can be seen in the flow chart bellows:



### 3.6 Data collection

#### 3.6.1 Determining of population and sample

Sutrisno Hadi (2002) describes the relationship of population and the sample as follows: samples are some individuals who investigated the individual's overall research. A good sample of a population sample representative described the situation means that the maximum population.

There are two populations in this research are land use and population. (1) The population of land use is land use in the study area; (2) The population of resident, sampling techniques conducted.

The population of land use is divided into:

- a. Inner fringe, non-agriculture land began dominance. The built-up environment and the natural environment balanced (40 per cent to 60 per cent of agricultural and conservation areas). It covers the area around 2 km from city center;
- b. Outer fringe, land use dominated by features of provincial (60 per cent to 90 per cent of agricultural and conservation areas). It covers the area around more than 2 km up to 5 km.

The resident population is determined by farmers and "come in population" in the area of rural-urban fringe, with the following criteria:

- a. The farmer referred is the owner of agricultural land and not agricultural laborers. Selection of farmers as owners of agricultural land is intended: the landlord has the effect of changes in land as opposed to "agricultural laborers". Selection of farmers as land owners also intended to determine the farmer's commitment in maintaining the agricultural land and agricultural activities.
- b. While, "come in population" are immigrants who own the building and not the tenant because the tenant has no effect on changes in land.

In this study, the location of the study is the rural-urban fringe area in the City of Malang. In the administrative regions used as study sites can be seen in the following table:

Table 3.2 Administrative Area of Study Sites

Sub-district	Information
1. Blimbing	
2. Lowokwaru	Only included in the study area (Rural-urban fringe area)
3. Sukun	
4. Kedungkandang	

Furthermore, sampling in this study carried out by several stages as follows:

- The first step is to find the number of existing farmhouse population in the surveyed area. The total number of existing home population is 2890.
- After we know the number of existing farmhouse in the study site, the next step is to determine the total number of "own house". Determination of the number of "own house" refers to the Master Plan for Housing in the City of Malang.
- The next step is to determine the number of samples. The sample size should be taken from a population there has been no unity of opinions from the experts. Therefore, in

determining the sample in this study used the Tables for Statistician (Sample Sizes), Herbert Arkin and Raymond R. Colton, 1963 with 95 per cent confidence level and probability of 5 per cent. In using this table, the number of farmer's house is 2324 rounded to 2000 (based on the table Arkin), so that the sample is 184 samples. After obtained the number of samples, the next step is to determine the sampling area, in this case used a purposive sampling method, by dividing the residential area on the location of the study to 23 (according to respective villages), namely:

1. Area A (Tunjungsekar)
2. Area B (Jatimulyo)
3. Area C (Mojolangu)
4. Area D (Tlogomas)
5. Area E (Jodipan)
6. Area F (Purwodadi)
7. Area G (Pandanwangi)
8. Area H (Purwantoro)
9. Area I (Polowijen)
10. Area J (Arjosari)
11. Area K (Tanjungrejo)
12. Area L (Lesanpuro)
13. Area M (Madyopuro)
14. Area N (Kedungkandang)
15. Area O (Buring)
16. Area P (Bumiayu)
17. Area Q (Wonokoyo)
18. Area R (Bandungrejosari)
19. Area S (Sukun)
20. Area T (Bandulan)
21. Area U (Pisangcandi)
22. Area V (Kebonsari)
23. Area W (Gadang)

It will get the number of samples in each area. After size and number of samples of each area is known, then the next step is capture samples in each area. In this sampling was done by cluster random sampling in each area.

### **3.6.2 Research tools**

The goal of making the questionnaire is to obtain information that is relevant to the purpose of research. Types of questions used in this study are questions that are closed, the combination of closed and open questions, and open questions. While, secondary data are used as a tool in this research are the maps associated with this research, among others, the basic physical map or administrative map of the region and other maps that support this research.

### **3.6.3 Source of data collection**

**Primary Data:** were obtained by collecting data directly at the sites. Primary data were collected in several ways:

- **Interview**

The interview is a dialogue conducted interviewer for obtain information from the concerned. In this way, using a form of guided interviews, the interviews conducted by interviewers with a full and detailed series of questions as defined in a structured interview. The function of interviews in this study was conducted for obtain land use change process undertaken by the institution, the process of building in the area of rural-urban fringe, and the prevention of land conversion. Interview technique conducted on the parties concerned and is expected to provide information, namely: "Bappeda", Infrastructure Department, National Land Department, City Office, and villages that exist within the study area.

- ***Observation***

Observations are observing something through sight, sense of smell, and hearing. Observation technique was done by held direct research in the location of the study in order to cross checked the data obtained on the basis of other data collection techniques. The tools in the form of recording images and table entries are used for easy observation. The purpose of observation in this study area is for observing distribution pattern of building and agriculture. The observation is done by comparing land use between the ground state and the existing state of the study area. The definition of the basic state here is conditions of land use in 1990 and is the existing situation in 2010.

- ***Questionnaire***

Data collection was performed by filling up questionnaires to the residents in the study area. Questionnaires will be distributed by taking some of the population as a sample which will be representing the entire population in the study area. Completion of questionnaire aims for get the process of change by individuals, farmer's commitment to their agricultural land and farmer's commitment to their agricultural activities.

***Secondary Data:*** an indispensable supporting data in this study and form of documents. The secondary data obtained through the books and documents, obtained from the District Office, "Bappeda", Department of Settlement and Regional Infrastructure, City Office, National Land Department, Statistics Office, and libraries.

### **3.7 Analysis method**

In this study, the analysis is used a combination of qualitative and quantitative analysis. Qualitative analysis is used to support the analysis of quantitative or qualitative methods as a facilitator of quantitative research, through the merger method carefully and directed, flexibility and depth of analysis can be achieved (Fielding, 1986). Combining this method of analysis because it cannot be separated from primary and secondary data have been processed statistically. This research is also done with the interviews that are still looking and open, so it is possible to find new things.

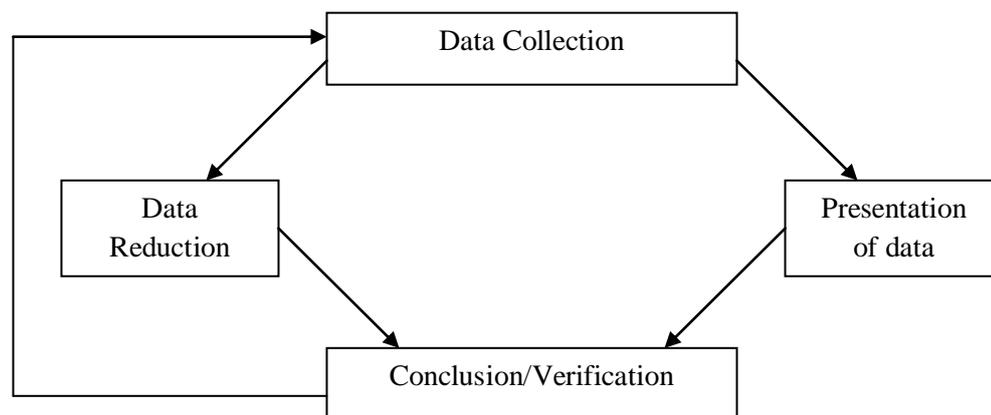
#### **3.7.1 Qualitative analysis**

Qualitative analysis is a data analysis performed in accordance with the data processing techniques such as, checking and tabulation of data and reading tables, graphs or figures are available; then, make the description and interpretation (Hasan, 2002). Qualitative analysis

used in this study included descriptive analysis of the determination of the location of rural-urban fringe areas, the characteristic pattern of development of rural-urban fringe areas, the characteristics of the process of development of rural-urban fringe areas and physical changes in rural-urban fringe areas. Qualitative analysis consisted of three flow activities occurring simultaneously, namely:

1. Data reduction, a process of selection, simplification, and transformation of raw data that came from written records in the field.
2. Presentation of data, as a set of structured information which gives the possibility of withdrawal of the conclusions and decision action.
3. Conclusions

For more details, interactive model of qualitative data analysis can be viewed via the following picture:



**Figure 3.1** Interactive model of qualitative data analysis (Miles and Huberman, 1992: 15-20)

### 3.7.1.1 Overlapping map

Overlapping map method used to determine the location of rural-urban fringe areas. The calculation with this method using ordinary GIS software support AutoCAD Map Release 7. The maps are in-overlay include:

- Building Distribution Map
- Distribution Map of Agricultural Land
- Land Use Map

The steps taken in determining the location of rural-urban fringe area are:

- Conducting separation of layer of each map is needed and make the observation grid where each cell of the same size i.e. 200 m x 200 m.
- Conducting analysis of intersection of the base map overlapping in the observation cell and cross check intersection results in the observation cell with the classification of types of rural-urban fringe based on the extent of the proportion of urban land use function, residential properties and the proportion of agricultural land. It also calculated based on the distance bands and square grid.
- Conducting field observations, also cross check the results of the intersection if found inconsistent results.

### 3.7.1.2 Descriptive exploratory analysis

According Hadari (2003), the method of description can be defined as problem-solving procedure was investigated by describing the state of the subject/object of research (a person, institution, society, etc.) in the present based on the facts that appear or as they are.

The analysis here is exploratory description, aims to describe the condition or status of the phenomenon. In addition, this study also wanted to know things related to the state of things. According to Arikunto (1998:245), qualitative data are described as a sentence in accordance with their respective categories to obtain a conclusion. Furthermore, quantitative data intangible numbers calculation or measurement that can be processed in several ways, among others:

1. Added, compared with the number expected and obtained percentages, this technique is often referred to as a qualitative description of the technique by percentage.
2. Added together and classified so that it becomes an order of sequence data. It made a good table which is only stopped until the table or processed further into the calculation the conclusion decision and for the benefit of its data visualizing, for example, graphics polygon, drawing diagrams, etc.(Arikunto, 1998:246).

This type of analysis using descriptive exploratory method is:

**A. *Prevention of land conversion***

Historical side of the others in analyzing the process of development of rural-urban fringe area is land control. Control of the land is meant are other forms of prevention of land conversion conducted during the last 20 years in the study area. This analysis was obtained from interviews with relevant agencies to the issue of land control in the study area. From the analysis of prevention of land conversion for 20 years, it will get the appropriate method to estimate the development, will happen in the future.

**B. *The Pattern of classification buildings***

The pattern of classification of buildings in rural-urban fringe areas aims to investigate the forms of growth oriented in every area of rural-urban fringe in a spatial, both in the area of inner, outer, and the urban shadow zone. There are three patterns formed by classification of buildings that were examined in this study that is concentric development, ribbon development, and Leapfrog development. This analysis examined the results of field observations to obtain the results and review of existing secondary data to assess the pattern of classification of buildings in the last 20 years at the observation points in 1990, 2000, and 2010.

### **3.7.2 Quantitative analysis**

Quantitative analysis was done by analyzing the data obtained through direct research in the field, using questionnaires. Results of questionnaires that have been edited previously entered into a computer program into a data base of ready-made. Then, the data is processed so that it can be displayed in a frequency table. The preparation is intended to simplify the frequency table in view of the variable distribution patterns. Chi-square technique to display data in a cross-tabulation format intended to determine the relationship between variables influence and are influenced.

#### **3.7.2.1 Descriptive statistical analysis**

Analysis of descriptive statistics is that the analysis presented in the form of tables and graphs the frequency distribution. The presentation in table form can be divided into three (Slamet, 1993:18), namely: (1) Univariate table, i.e. the table which presents a single variable; (2) Bivariate table, the table presents the combination of two variables; (3) Polyvariate table is a table which presents more of a combination of two variables.

According Kartono (1996:335-338), the variables classified according to size or magnitude, often arranged in the form of frequency distribution. The thing to remember in making a frequency distribution is as follows: the number of interval-class that will be used, the size-class intervals and the framework of interval-class.

#### **A. *Changes by individuals***

One of the changes in the development of rural-urban fringe area is the changes by population individual. Resident preferences in choosing a place to live, the historical changes in shape, and land use which made people become the subject of analysis. The main reason for changes by individuals from the results of the election residential and land development process that occurred in the past can be recognized. The analysis also found from the filling of the questionnaire respondents, and interviews with sources who can explain clearly descriptive of the changes made on the basis of data generated.

#### **B. *Changes by institutions***

Apart from individuals, changes in rural-urban fringe areas conducted by the policies adopted by the institutions are also examined in this study the dimension of time. Analysis of changes in the institution has historically argued, the changes by the institutions of the results of interviews with relevant agencies of the municipality, county, related agencies in government, and other institutions involved in the changes that result in the development of rural-urban fringe areas in the study area.

#### **C. *Farmer's commitment to their agricultural-land***

This analysis arises to see the commitment of farmers to their agricultural land with the insistence of land use change because of development and rising land prices in the area of rural-urban fringe. The data used for this analysis is "in-depth interviews" of some existing farmers in each village.

#### **D. *Farmer's commitment to their agricultural-activities***

This analysis is closely related to the above analysis it is just that the subject of this analysis is a strategy for the livelihoods of farmers. Here, will find the background why there are some farmers are still working on the farm, and there is not, through interviews with several farmers in each village.

### **3.7.2.2 Analysis of agricultural-land reduction**

Reduction of agricultural land as a basis for analyzing the pattern of regional growth in rural-urban fringe areas because reduction of agricultural land is a significant impact due to construction of housing or other urban functions.

Agricultural area of each municipality within the study area will be compare in the last 20 years at the observation points in 1990, 2000, and 2010. By comparing the reduction in agricultural area, then it will get the pattern of development among regions in the 3 kinds of

spatial context of rural-urban fringe. Reduction of agricultural land area can be calculated according to the formula proposed by Yunus (1997:158), namely:

$$P_{elp}/\text{year} = \frac{L_{lp} \left( t_1 \right) - L_{lp} \left( t_2 \right)}{d}$$

Where Pelp means agricultural-land reduction (ha/year), Llp means agricultural-land area (ha), t means time (year), and d means difference in time (year).

Process mapping carried out after the calculation process is complete. This was conducted to obtain a-spatial pattern accordance with the results calculations.

### 3.7.2.3 Analysis of additional of residential-land

The addition of residential land in rural-urban fringe is the result of the centripetal and centrifugal force and lateral movement towards the region. Increased population and encourage migration to rural-urban fringe land to encourage the construction of settlements with the annex "green land" in the urban fringe of the city. By examining the pattern of the addition of settlement land, then get some of the rate of urbanization to the rural-urban fringe areas. The formulation of calculations of this analysis presented by Yunus (1997:158) as follows:

$$P_{nlp}/\text{year} = \frac{L_{lnp} \left( t_1 \right) - L_{lnp} \left( t_2 \right)}{d}$$

Where Pnlp means additional of residential-land (ha/year), Llnp means residential-land area (ha), t means time (year), and d means difference in time (year).

Process mapping carried out after the calculation process is complete. This was conducted to obtain a-spatial pattern accordance with the results calculations.

### 3.7.2.4 Analysis of additional of non-agriculture land and residential-land

This analysis is similar with the addition of land settlement pattern analysis. The subject of analysis is non agricultural land and settlements. The objective of this analysis was to determine the rate of addition of non agricultural land and settlements as the process of development towards rural-urban fringe areas.

The formulation of calculations of this analysis presented by Yunus (1997:158) as follows:

$$P_{nlnp}/\text{year} = \frac{L_{lnpn} \left( t_1 \right) - L_{lnpn} \left( t_2 \right)}{d}$$

Where Pnlnp means additional of non-agriculture land and residential-land (ha/year), Llnpn means non-agriculture land and residential-land area (ha), t means time (year), and d means difference in time (year).

### 3.7.2.5 Analysis of acceleration of urban sprawl

Acceleration of agricultural land reduction is intended to determine the rate of acceleration "urban sprawl" in the area of rural-urban fringe. The higher the number shown in the calculation of the analysis, it concluded the slower the acceleration of urban sprawl in the rural-urban fringe.

The formulation of calculations of this analysis presented by Yunus (1997:158) as follows:

$$A_{\text{hlp}} / \text{year} = \frac{L_{\text{lp}} \text{ (2)}}{L_{\text{lp}} \text{ (1)} - L_{\text{lp}} \text{ (2)}} \cdot \frac{1}{d}$$

Where Ahlp means acceleration of urban sprawl index, Llp means agricultural-land area (ha), t means time (year), and d means difference in time (year).

### 3.7.2.6 Crosstabs analysis

The purpose of a cross-tabulation is to show the relationship between two variables. A number of tests are available to determine if the relationship between two cross-tabulated variables is significant. One of the more common tests is chi-square. One of the advantages of chi-square is that it is appropriate for almost any kind of data. Pearson chi-square tests the hypothesis that the row and column variables are independent. The actual value of the statistic is not very informative. The significance value (*Asymp. Sig.*) has the information we are looking for. The lower the significance value, the less likely it is that the two variables are independent (unrelated) (Field, 2005).

## 3.7.3 Analysis of development

### 3.7.3.1 Analysis of SWOT

SWOT analysis is a qualitative descriptive method. The aim of this analysis is to know the strengths, weakness, opportunities and threats, control of urban development in the study area based on the characteristics, and the existing conditions.

The potential is an advantage of resources, skills, abilities, or other internal aspects that are owned. Other problems are the weaknesses or limitations or inefficiencies in resources, skills, capabilities or other internal aspects that hinder effective usability. Opportunity is the most desirable situation. Rather, the challenge/threat is the least desirable situation from an area.

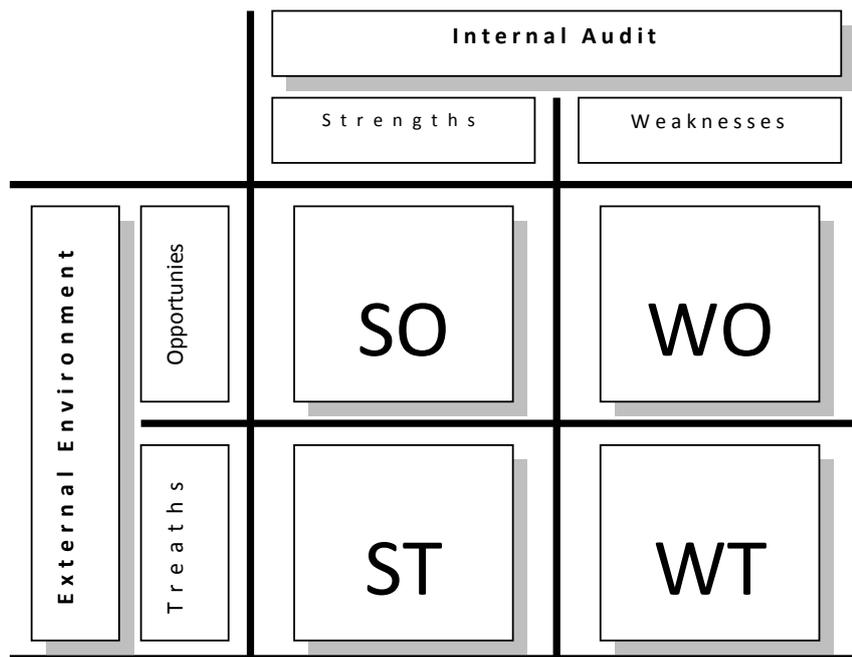
SWOT analysis is used to facilitate in:

- Provide an overview of the issues that need to be indicated for certain purposes.
- Giving the current situation and future scenarios that will become an explanation of each potential performed by descriptive analysis.

The steps of workmanship SWOT analysis, based on the study are as follows:

- Determining existing condition that affects development in this area of land use changes in rural-urban fringe areas, to see the opportunities, strengths, weaknesses and threats that can affect urban development in the area of rural-urban fringe.
- From the matrix of SWOT analysis obtained by any factor which is strength, weakness, opportunities and treatment will then be interpreted qualitatively so that later on known and potential development opportunities owned.

Each component of the observation in the SWOT analysis can be viewed separately or combined in a matrix (2x2). Sample matrix can be seen in the picture below:



**Figure 3.2** SWOT Analysis Matrix (Nugroho, 2002)

The results of the SWOT analysis will produce several strategies, among others:

- S-O strategy, which is used to strengthen the potential for gain opportunities that are available in the external environment.
- W-O strategy, aimed at improving internal weaknesses by taking advantage of opportunities and the external environment.
- S-T strategy aims to minimize the impacts that will occur from the external environment.
- W-T strategy aims to strengthen themselves in an effort to minimize the internal weaknesses and reduce the external challenges.

### 3.8 References

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## CHAPTER 4

### COMBINATION MODEL TO IDENTIFY LOCATION OF RURAL- URBAN FRINGE AREA

#### 4.1 Introduction

This research is concerned with land use between urban area, rural area, and how to find an appropriate model to identify the location of the rural-urban fringe area. Land use as a human activity product on earth's surface shows a large variation, within both local and regional city. An understanding of land use forms that characterize the built-up area, urban-rural transition area, and the countryside itself, is a matter of principle to do its spatial structure differentiation. An understanding of "urban" and "rural" also needs attention - especially "urban" related to urban life and "rural" associated with countryside life. Aspects of life itself consist of urban and countryside aspects: political, social, economic, cultural, psychological, technological, and physical. In discussing this morphological approach, someone insisted on the physical aspect, and one of which is land use.

To distinguish between types of urban and rural land use, these kinds of linkages with agricultural land became the main focus because most of the provincial land use type is associated with agricultural activities. Thus appears the term 'urban agricultural land' and 'rural agricultural land'. Lands located in urban areas (morphologically) are used for agricultural purposes, while 'rural agricultural land' has many examples and is common in rural areas. Such land use includes: rice field, dry land, garden mix, etc. Thus, identifying with provincial agricultural or non-urban agricultural is not entirely correct, but linking the proportion of 'urban agricultural land' compared with 'urban non-agricultural land' is small, its presence ignored. Similarly, "rural non-agricultural land" and "rural agricultural land" types dominate land use in rural and urban areas. To dominate land use type in rural and urban, the definition of 'dominance' is used for any discussion of spatial structure in terms of land use type. The main problem lies in the transition area from the appearance of a "real urban" to "real rural" appearance. In this transition area, the domination problem appears to be blurred, especially for regions moving from urban to rural. However, counting of land use type can be achieved with the grid system approach, administrative approach or physical approach. From the calculation of land use area in each cells (grid system approach) or 'areal units' (administrative and physical approach), the percentage of land use orientation can be known and sub-zone of each cell can be determined also (Yunus, 2000, pp. 162-164).

The Rural-urban fringe area is the most important area in the city because if city center is insufficient, the target of urban development will move to rural-urban fringe area. This situation has happened not only in developed countries but also will occur in developing countries including Indonesia. Indonesia is one of the most highly populated countries in the world with a population of over 237 million people in 2010. Land use changes in rural-urban fringe area that are fast and large-scale have given rise to various problems that are quite complex in several Indonesian cities, especially in terms of agricultural land conservation. In fact, it is difficult to trace boundaries of rural-urban fringe areas clearly because of the mixing of urban and provincial properties in an area once. For this reason, this research is important for rural-urban planning in developed countries and developing countries, especially in Indonesia, if there is an aim to make an appropriate concept and strategy to anticipate urban

development in the rural-urban fringe area. This research also will present a new model that can be used by planners to identify rural-urban fringe area location. The Approach towards determination of rural-urban fringe location consists of two kinds: the grid system approach, which entails dividing an area into cells; the administrative approach creates an administrative region as area units, then cells or unit area are classified into urban fringe division.

The objective of this research is to identify rural-urban fringe area location based on combination model and the main purpose is to prove that the combination model is an appropriate model for rural-urban fringe area. This study investigates this problem by comparing result and interpretation of three models with the same data. Firstly we discuss three models used to identify rural-urban fringe area location using urban-rural land use, spatial structure, and combination model. Secondly, we analyze land-use type changes in the study area, using three models for 1990, 2000, 2010, and compare them with the zoning status of each period. Thirdly, we examine the three models to determine the most appropriate model for rural-urban fringe area location.

#### **4.2 Land use and rural-urban fringe**

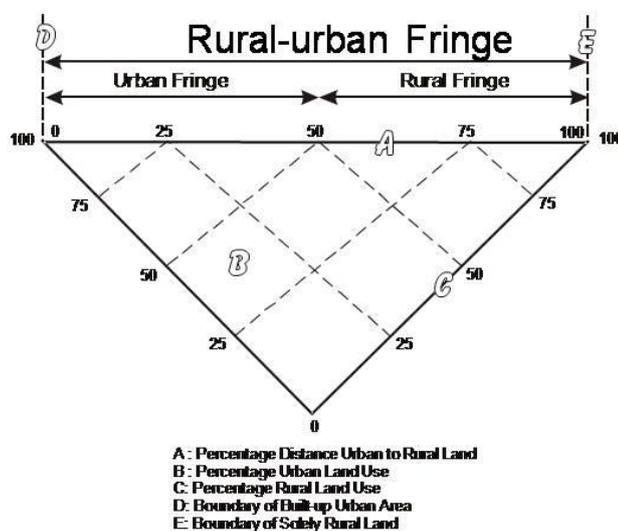
There are many studies about land use changes at the national scale as well as the smaller scale, such as cities or villages (Himiyama, 1994, 1998; Hoshino, 2001; Verbist et al., 2005). These studies have regarded a region as an aggregated system that can be used to estimate only the amount of land-use change (Rustiadi and Kitamura, 1998). Braimoh and Onishi (2007) identified the factors responsible for residential and industrial/commercial land development in Lagos. They classified land use into four units: (1) Residential, (2) Industrial/commercial, (3) Non-urban, and (4) Water.

T.L. Smith's (1937) discussion of the "urban fringe" around Louisiana marked the first use of this term, signifying "the built-up area just outside the corporate limits of the city". Kurtz and Eicher (1958) differentiate between "fringe" and "suburb" while Wissink (1962) defines "fringe", "suburbs", "pseudo-suburbs", "satellites" and "pseudo-satellites"; Schnore (1957) distinguishes between "satellites" and "suburbs". A number of writers have described different types of suburbs, some of which could be synonymous with the "fringe" of another research worker.

Pryor (1968) calculated the percentage of urban land use, percentage of provincial land use and percentage of distance from the main urban area. The three components are combined in the rural-urban land use triangle model. The creation of this model based on the idea of gradual transformation from city to village or vice versa. The 'distance decay principle', where the further away from the 'real urban' appearance will increasingly blur in the town, also applies here. In contrast, the village became clear appearance. In other words, it can be said that the dominance of urban land use forms will increase if it closes to urban area and vice versa.

Pryor (1968) suggested four sub-zones in the 'regional city' (Figure 4.1): (1) urban area, (2) urban fringe, (3) rural fringe, and (4) rural area. The urban area is the area that land use forms dominated by urban, while the rural area is dominated by agriculture. The urban fringe, that sub-zone of the rural-urban fringe in contact and contiguous with the central city, exhibits a density of occupied dwellings higher than the median density of the total rural-urban fringe.

The rural fringe, that sub-zone of the rural-urban fringe contiguous with the urban fringe, exhibits a density of occupied dwellings lower than the median density of the total rural-urban fringe. Furthermore, the rural-urban land use triangle model combines the concept of urban invasion with the heterogeneous land use typical of the fringe.



**Figure 4.1** Rural-urban land use triangle model (Pryor, 1968)

Studies of land-use changes and rural-urban fringe have been superficial in many regions. It seems that rural-urban fringes are neglected because of the difficulties of grasping the spatial relationships between land use changes and rural-urban fringes location.

#### 4.2.1 Urban-rural land use model

Yunus (2000, pp. 168-169) adds new sub-zones in sub-zone differentiation according to Pryor (1968). They are located between the urban fringe and rural fringe: (1) urban areas; (2) urban fringe; (3) urban-rural fringe; (4) rural fringe, and (5) rural areas. The urban area is the area where the land use is 100 per cent urban-oriented, while the urban fringe is the area (zone) dominated mainly by forms of urban land use (more than 60 per cent of urban land use and less than 40 per cent of rural land use). Urban fringe areas are located from the border point of the urban built-up to within 40 per cent of the point (calculated from the overall distance of a 'real urban' to 'real rural'). Rural fringe is a sub-zone of the percentage of its urban land use in balance with its rural land use. The comparison ranges from 40 per cent to 60 per cent where the explanation is more than 40 per cent urban land use and less than 60 per cent of rural land use. In this condition, a zone shows the comparison of urban land use in balance with provincial land and the structural transformation of land use will occur, although it is not as fast in the urban fringe area (Figure 4.2).

Provincial land use dominates the sub-zone of the rural-urban fringe, where at least 60 per cent of its land use form is rural. Transformation of land use structure runs more slowly than the sub zone of rural fringe. The rural area is an area which all land use forms are geared towards agricultural land use. The process of structural transformation of the general land-use factors is associated with distance from built-up area, but in areas located along transportation routes and at locations near the junction of the ring road and radial roads, the

distant decay principle associated with the acceleration of transformation structure of land-use do not apply.

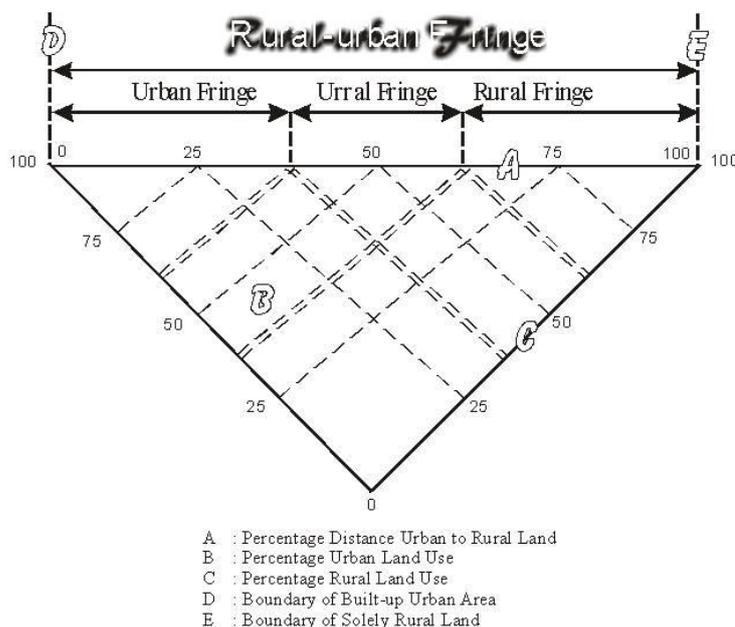


Figure 4.2 Urban-rural land use model (Yunus, 2000)

#### 4.2.2 Spatial structure model

Slightly different from the opinion of Pryor and Yunus, especially in areas that lie between the “real urban” and “real rural”, Russwurm suggests three sub-zones: (1) inner fringe; (2) the outer fringe, and (3) urban shadow zone (Yunus, 2000, pp. 167-168). Russwurm also identified regional rural-urban fringe (the term of Pryor).

This structure, based partly on Russwurm (1975b, 1977a) and Bryant (1982), is particularly helpful, since it stresses the notion of a continuum between urban area and rural hinterland (Figure 4.3). As another opinion, the basic problem is the dominance of the introduction of the existing sub-zone. The inner fringe is marked by a number of agricultural land conversions to non-agricultural land. Penetration of land owners rather than farmers happens a great deal in this sub-zone. The outer fringe is the area/sub-zone where village land use is dominant. Provincial land conversion into urban land happens a great deal, but the frequency is not as high as in sub-zone of inner fringe. Infiltration of urban appearance begins to appear in this zone. In the cities of Western countries, cemeteries and land for stacking carcasses are among the characteristics of the outer fringe areas. This is reasonable because such forms require vast land that is plentiful and cheap. Land ownership is still dominated by farmers. The urban shadow zone is the area where the elements of urban morphology begin to infiltrate, but is still minimal. This zone bordered directly with real urban areas. The distributor of its zone is a conceptual model only. Not all cities are marked by a sequence of sub-zones such as in the model and it not always spread evenly in all directions.

The structure represented in Figure 4.3, is, of course, an ‘idealized’ one. The full sequence of types does not occur around all centers or even in all directions. Sometimes an abrupt change may occur in fringe to rural hinterland. On the south bank of the Montreal region, for

example, the metropolitan influences are reduced significantly to the south-east of the river (INRS, 1973).

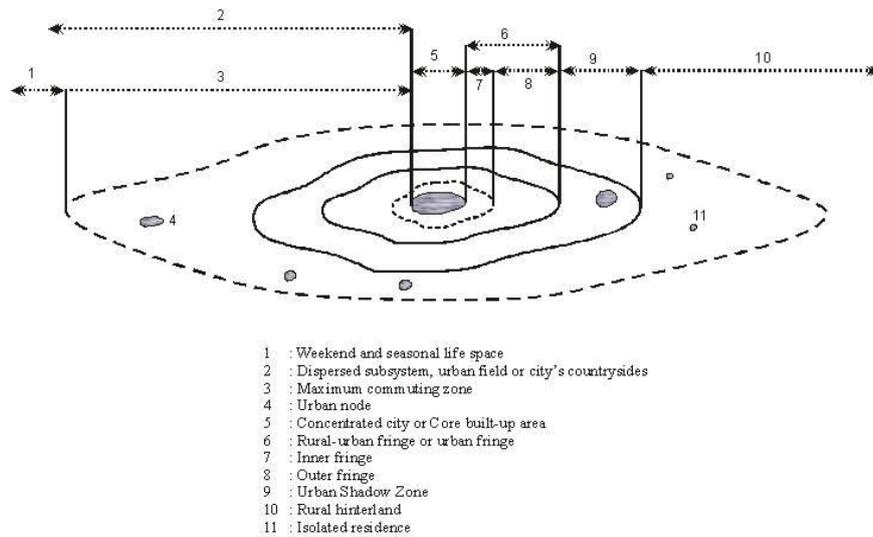


Figure 4.3 Spatial structure model (Russwurm, 1975)

### 4.3 Study area

The present study selected four sub-districts and 23 villages, which have a total area of about 8164.33 hectare (Figure 4.4). In 2010, there were 816,637 inhabitants (Statistic of Malang City, 2009). The study area located between 112.06 ° and 112.07 ° (East longitude) and 7.06 ° - 8.02 ° (South latitude).

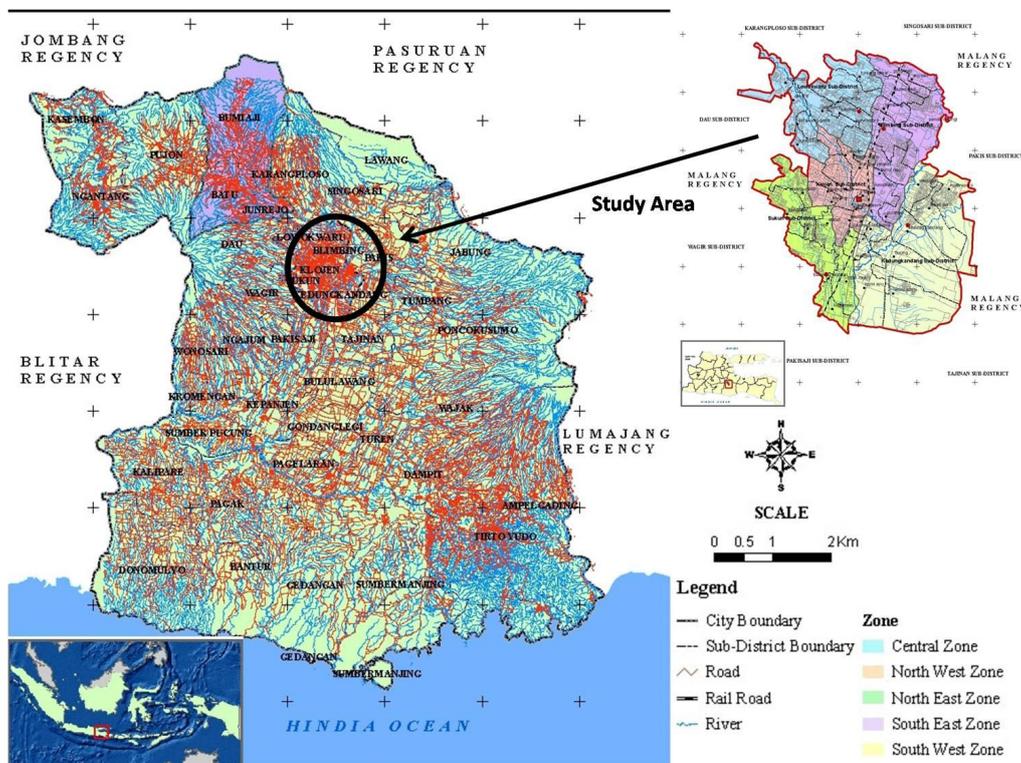
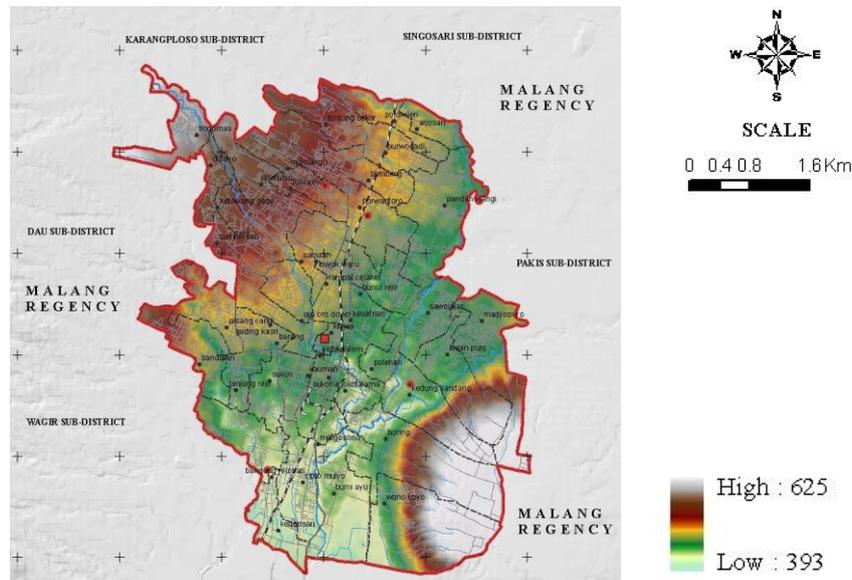


Figure 4.4 The location of study area and the study area showing the four sub-districts and their boundaries

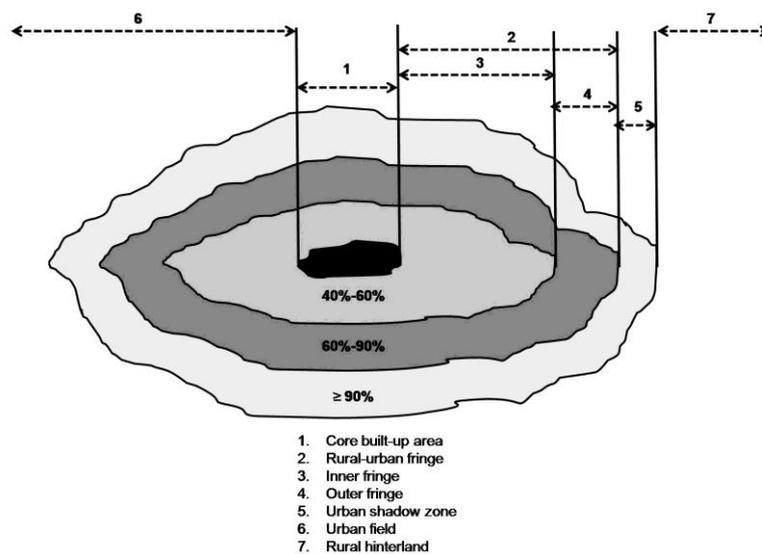
The study area has a topography that is most flat (96.3 per cent) with slope 0-15 per cent and a height of 380 meters to 667 meters above sea level (Figure 4.5).



**Figure 4.5** Digital elevation model of the study area

#### 4.4 Combination model

In this research, we used a combination model to identify rural-urban fringe area location. In this model, rural-urban fringe area location is determined by the proportion of urban land use functions, residential properties and the proportion of agricultural land use. It was also calculated based on the distance bands (Figure 4.6).



**Figure 4.6** Combination model (Agustin and Kubota, 2010)

The basic research division of rural-urban fringe area location is divided into two sub-zones. The first is inner fringe, in which non-agriculture land began to be dominant. The built-up

environment and the natural environment are balanced (40 per cent to 60 per cent of agricultural and conservation areas). It covers an area of around 2 kilometers from the city center. The second sub-zone is the outer fringe, in which land use is dominated by provincial features (60 per cent to 90 per cent of agricultural and conservation areas). It covers an area from more than 2 kilometers and up to 5 kilometers. Measurement of the distance bands of each sub-zone calculated from the total radius of the city.

### 4.5 Research method

Aerial photographs were taken in 1990, 2000, and 2010 and are used as the data for the research. Based on these data, 17 classifications were identified (Table 4.1). It was difficult to obtain the data of land use every five years. We created digital maps of four types of land-use with grid data (Figure 4.7). The 17 classifications divided into four land-use types: forest/farmland (F); urban-land (U); public-land (P); developing-land (D). The overall classification system is shown in Table 4.1.

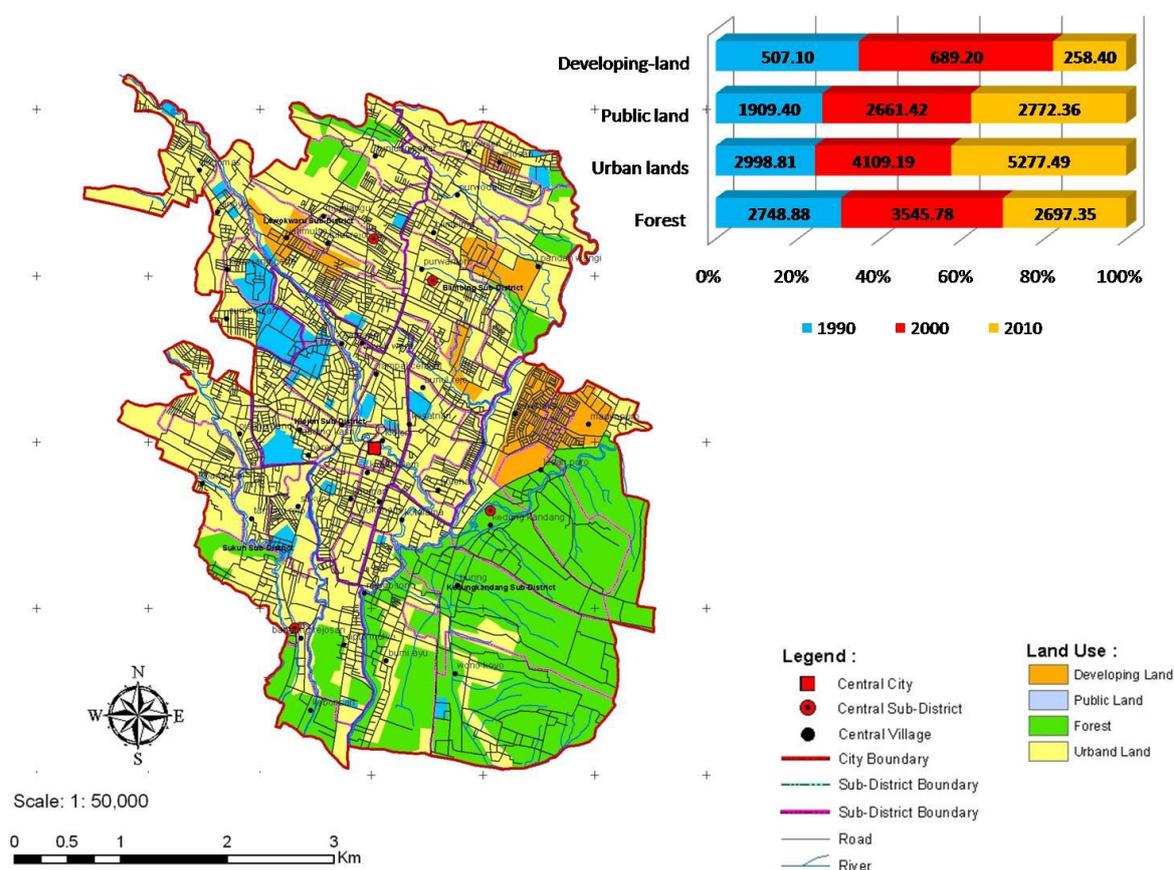


Figure 4.7 Land-use types in 1990 to 2010

The percentage of land-use types in each period obtained by overlaying land-use and grid data (Figure 4.7). The percentage of dwellings, industry, office-affairs, military, commercial, and public land occupied more than 80 per cent. Forest and farmland occupied less than 20 per cent.

**Table 4.1** Classification of land-use types

Land use types	No.	Classification
Forest and farmlands	1	Paddy field
	2	Moor
	3	Plantation
Urban lands	4	Dwellings
	5	Industrial
	6	Office affairs
	7	Military
	8	Commercial
Public land	9	Terminal
	10	Road/drainage
	11	Education
	12	Liturgy
	13	Recreation
	14	Water reservoir
	15	Healthiness
	16	Green space
Developing land	17	Vacant

In this research, we used a combination model to identify rural-urban fringe area location. In this model, rural-urban fringe area location is determined by the proportion of urban land use functions, residential properties and the proportion of agricultural land use. It was also calculated based on the distance bands and square grid (Figure 4.6). The basic research division of rural-urban fringe area location is divided into two sub-zones. The first is inner fringe, in which non-agriculture land began to be dominant. The built-up environment and the natural environment are balanced (40 per cent to 60 per cent of agricultural and conservation areas). It covers an area of around 2 kilometers from the city center. The second sub-zone is the outer fringe, in which land use is dominated by provincial features (60 per cent to 90 per cent of agricultural and conservation areas). It covers an area from more than 2 kilometers and up to 5 kilometers.

Morphological identification of cities in the study area entailed dividing the grid area of the city based on observations of cells of each area of 4 hectare. Each of these observation cells count the ratio of land to produce cells belonging to the category of inner fringe, outer fringe and urban shadow zone. Then, in order to know the administrative area of the three categories above, the urban fringe areas are grouped into the same village administration. To combine square grid and distance bands, we used Geographic Information System (GIS) software (ArcGIS 9.3), and ArcMAP.

For the construction of the grid, we utilize pre-existing secondary data such rates 400mx400m. After that, we divided into 200mx200m. Then, we proceed with giving the name of each cell: the horizontal giving the name using letters "A,B,C" and the vertical using the number "1,2,3". After the cells are completed, we create an overlay (INTERSECT) with the "base map" so that the grid cell can be fused with the "base map" (Figure 4.8).

The results for the three years were compared, with the purpose of identifying the land use type changes that had occurred over the 20-year period.

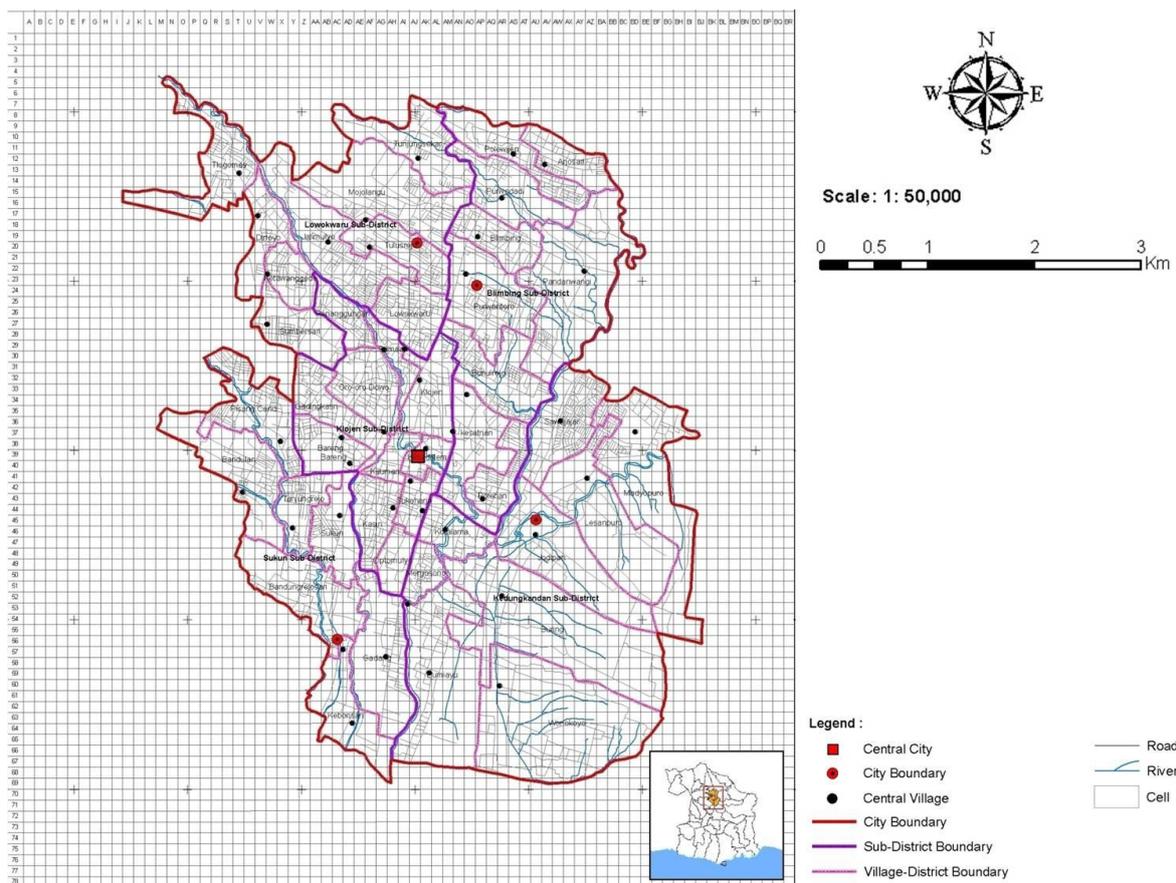


Figure 4.8 Observation cells in the study area 2010

## 4.6 Determining the location of rural-urban fringe area

### 4.6.1 Urban-rural land use

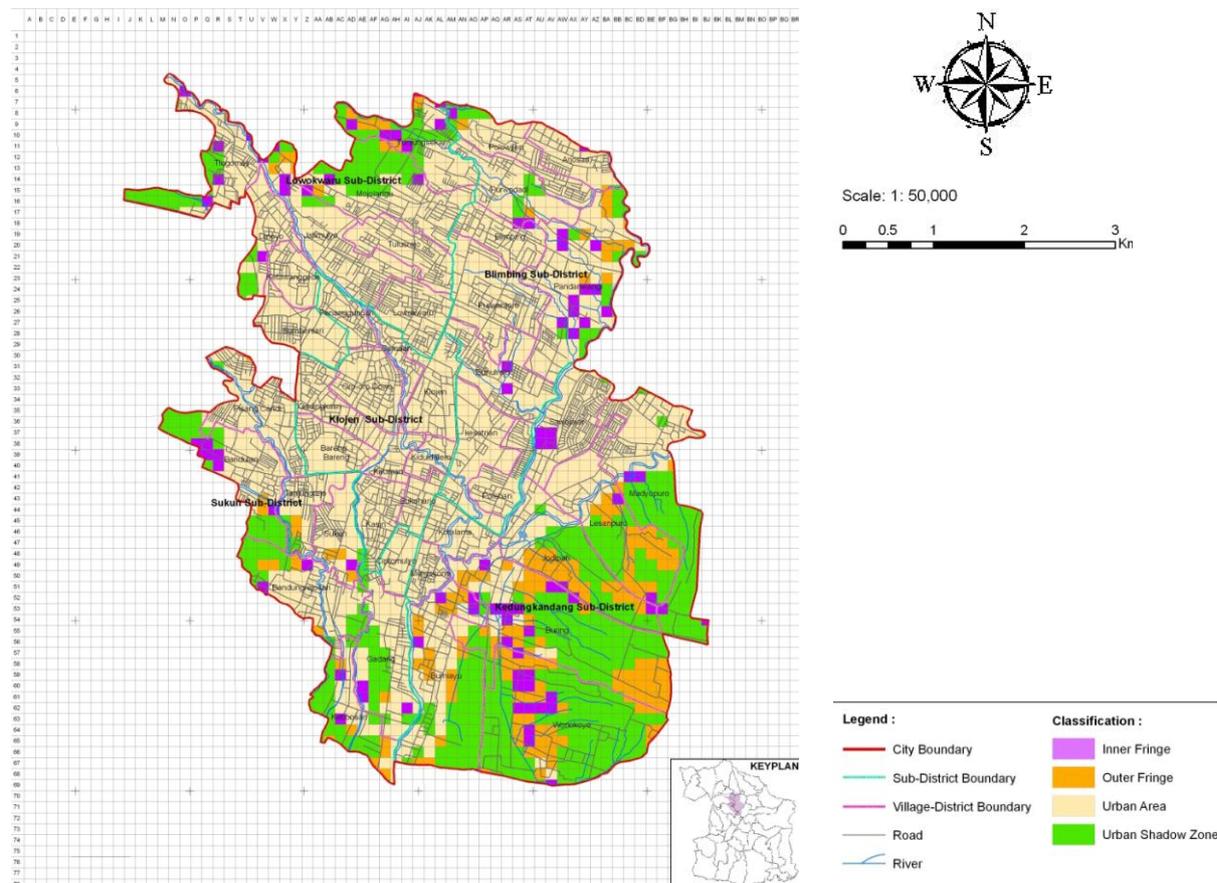
The total of rural-urban fringe areas is 2734.8 hectare or 33.50 per cent of the total area of the city. According to the classification, the dominance of the first area is the urban shadow zone of 1707.96 hectare or 20.92 per cent of the city, and the inner fringe area is the smallest at 367.23 hectare or 4.50 per cent of the city (Table 4.2 and Figure 4.9).

Table 4.2 Identification of rural-urban fringe area based on urban-rural land use model 2010

No.	Category of morphology	Area	
		(ha)	%
I	Urban area	5429.53	66.50
	Urban fringe area		
II	1 Inner fringe	367.23	4.50
	2 Outer fringe	659.61	8.08
	3 Urban shadow zone	1707.96	20.92
	Total of rural-urban fringe	2734.8	33.50
	Total of the City	8164.33	100.00

The rural-urban fringe area changes for 1990, 2000, and 2010. From 1990 to 2010, the outer fringe and urban shadow zone decreased, while the inner fringe increased in 2000 but

decreased in 2010. This happened because some parts of the inner fringe changed to the urban area in 2010.



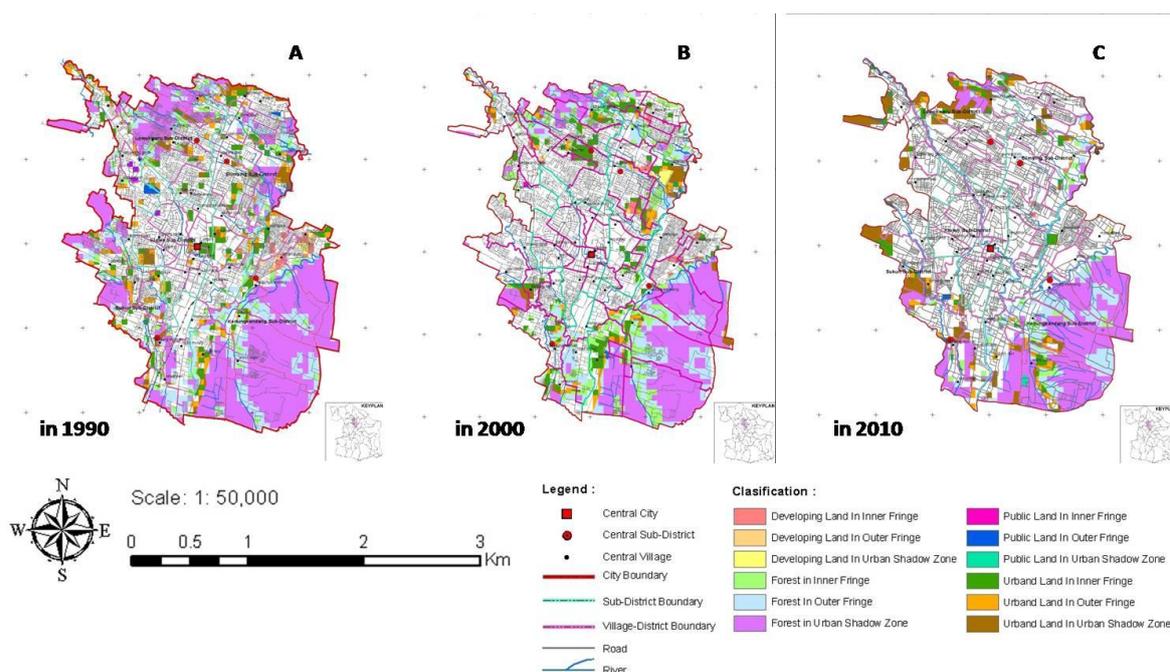
**Figure 4.9** Rural-urban fringe area based on urban-rural land use model in 2010. Inner fringe:   
Outer fringe: , Urban shadow zone:  Urban area:

We examined the land-use changes in each area by considering the percentage change in each land use. We made overlay land use with the grid cells of urban-rural land use model to obtain the pattern of land use changes in inner, outer and urban shadow zones.

**Table 4.3** Percentage of land-use types in the rural-urban fringe area based on urban-rural land use model

Period	Land-use types								
	Forest/Farmland		Urban-land		Public-land		Developing-land		Total (ha)
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	
1990	2778.88	57.16	1374.05	28.26	414.43	8.52	294.43	6.06	4861.79
2000	1713.78	43.17	1654.25	41.67	400.19	10.08	201.89	5.09	3970.11
2010	1092.2	39.94	1097.3	40.12	424.18	15.51	121.12	4.43	2734.8

Figure 4.10 shows that the pattern of land use type changes in inner fringe, outer fringe and urban shadow zone is leapfrog. From 1990 to 2010, the total of land-use types changed. Forest and farmland (F) decreased to 60.70 per cent. In contrast, urban land (U) increased around 20.39 per cent in 2000 and decreased to 34 per cent in 2010. Public land (P) decreased around 3.44 per cent in 2000 and that increased around 6 per cent in 2010 (Table 4.3).



**Figure 4.10** The pattern of land-use types in the rural-urban fringe area based on urban-rural land use model 1990 (a), 2000 (b), and 2010 (c)

#### 4.6.2. Spatial structure

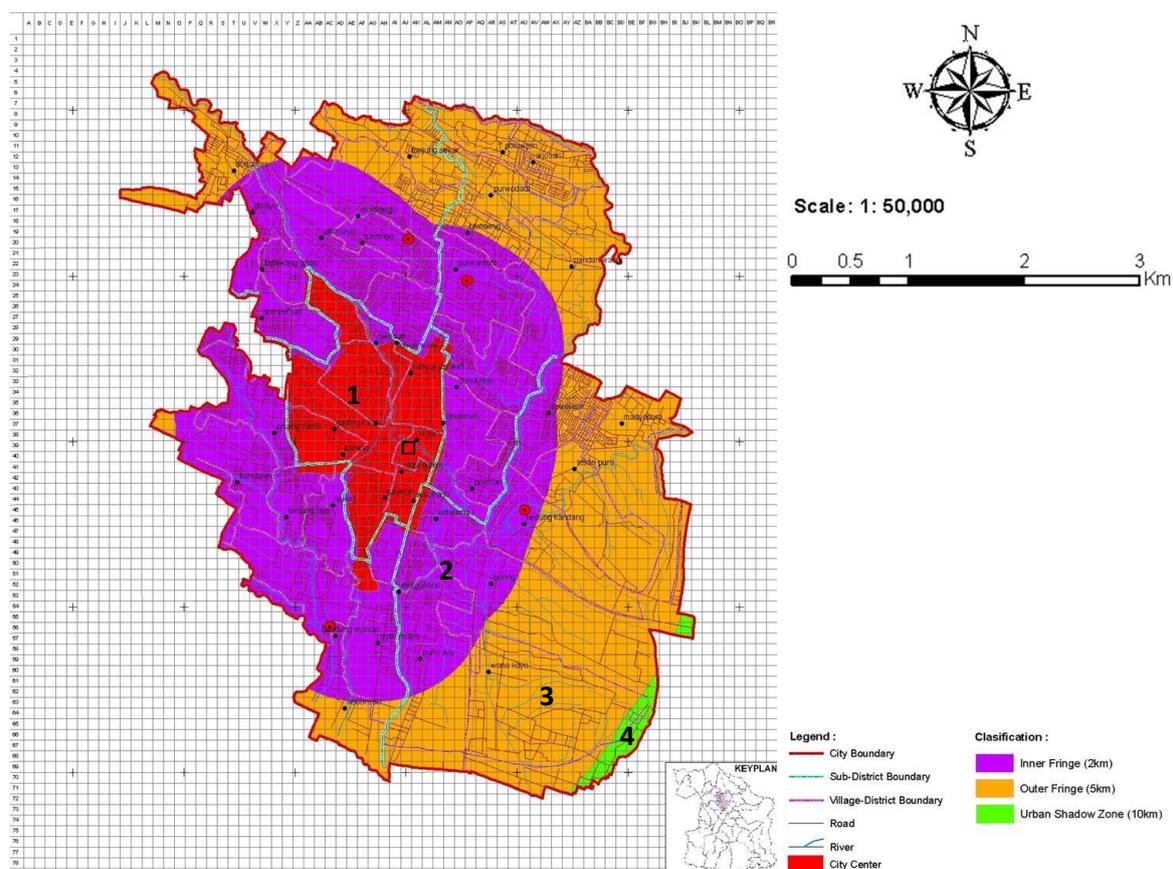
The total rural-urban fringe area based on the spatial structure model is 7188.52 hectare or 88.05 per cent of the total area of the city. According to the classification, the dominance of the first area is the inner fringe of 3715.16 hectare or 45.50 per cent of the city, and the smallest area is the urban shadow zone with 92.81 hectare or 1.14 per cent of the city (Table 4.4).

**Table 4.4** Identification of rural-urban fringe area based on spatial structure model 2010

No.	Category of morphology	Area	
		(ha)	%
I	Built-up area	882.50	10.81
	Urban fringe area		
II	1 Inner fringe	3715.16	45.50
	2 Outer fringe	3473.36	42.54
	Total of rural-urban fringe	7188.52	88.05
III	Urban shadow zone	92.81	1.14
	Total of the City	8164.33	100.00

This model is divided into three parts. Firstly, the inner fringe covers the area around 2 kilometers from the city center; secondly, the outer fringe covers the area from more than 2 kilometers and up to 5 kilometers from the city center; and thirdly, the urban shadow zone covers the area around more than 10 kilometers from the city center (Figure 4.11).

Determination of the distance of the inner fringe, outer fringe, and urban shadow zone towards the city center in each city depends on the radius of the city. We still use grid cells in this model to calculate the total area of each rural-urban fringe category by villages.

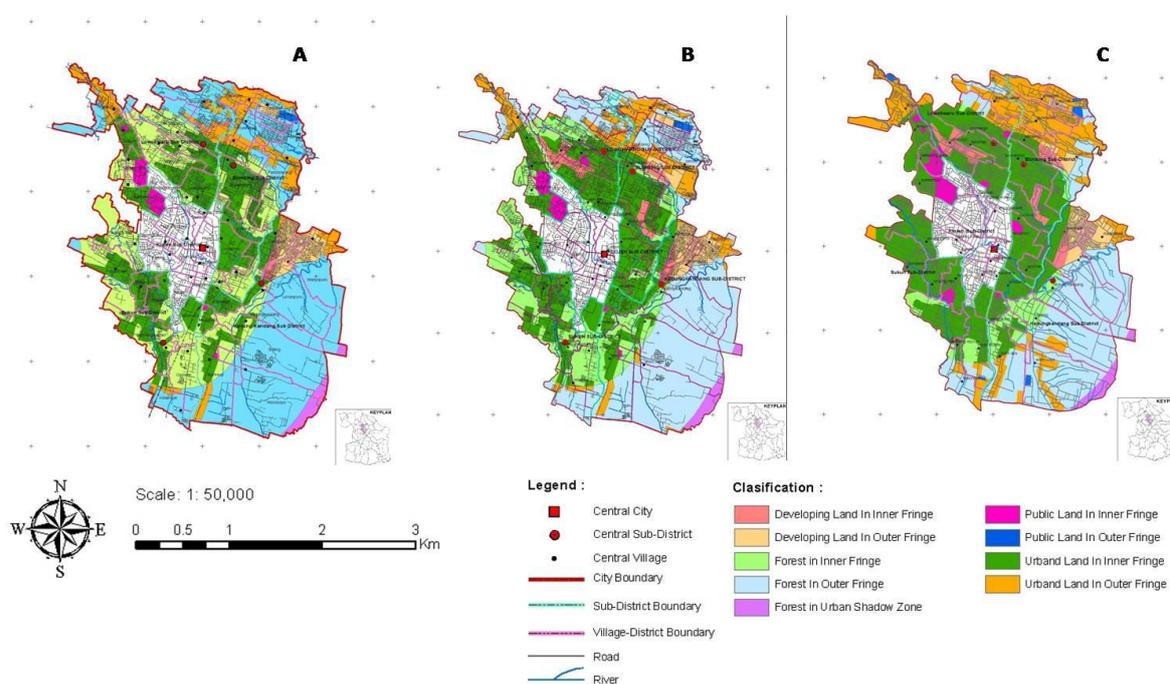


**Figure 4.11** Rural-urban fringe area based on spatial structure model 2010. 1: Core, 2: Inner fringe, 3: Outer fringe, 4: Urban shadow zone

Figure 4.12 illustrates that the pattern of land use types in the inner fringe, outer fringe and urban shadow zone is concentric. From 1990 to 2010, the total of land-use types changed. Forest and farmland (F) decreased around 63.02 per cent. In contrast, urban-land (U) and public-land (P) increased around 53.97 per cent and 30.55 per cent (Table 4.5).

**Table 4.5** Percentage of land-use types in rural-urban fringe area based on spatial structure model

Period	Land-use types								
	Forest/Farmland		Urban-land		Public-land		Developing-land		Total (ha)
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	
1990	2656.05	36.95	2698.94	37.55	1357.61	18.89	475.61	6.62	7188.52
2000	1981.89	27.57	3356.01	46.69	1461.42	20.33	389.20	5.41	7188.52
2010	982.28	13.66	4155.48	57.81	1772.36	24.66	278.40	3.87	7188.52



**Figure 4.12** The pattern of land-use types in the rural-urban fringe area based on spatial structure model 1990 (a), 2000 (b), and 2010 (c)

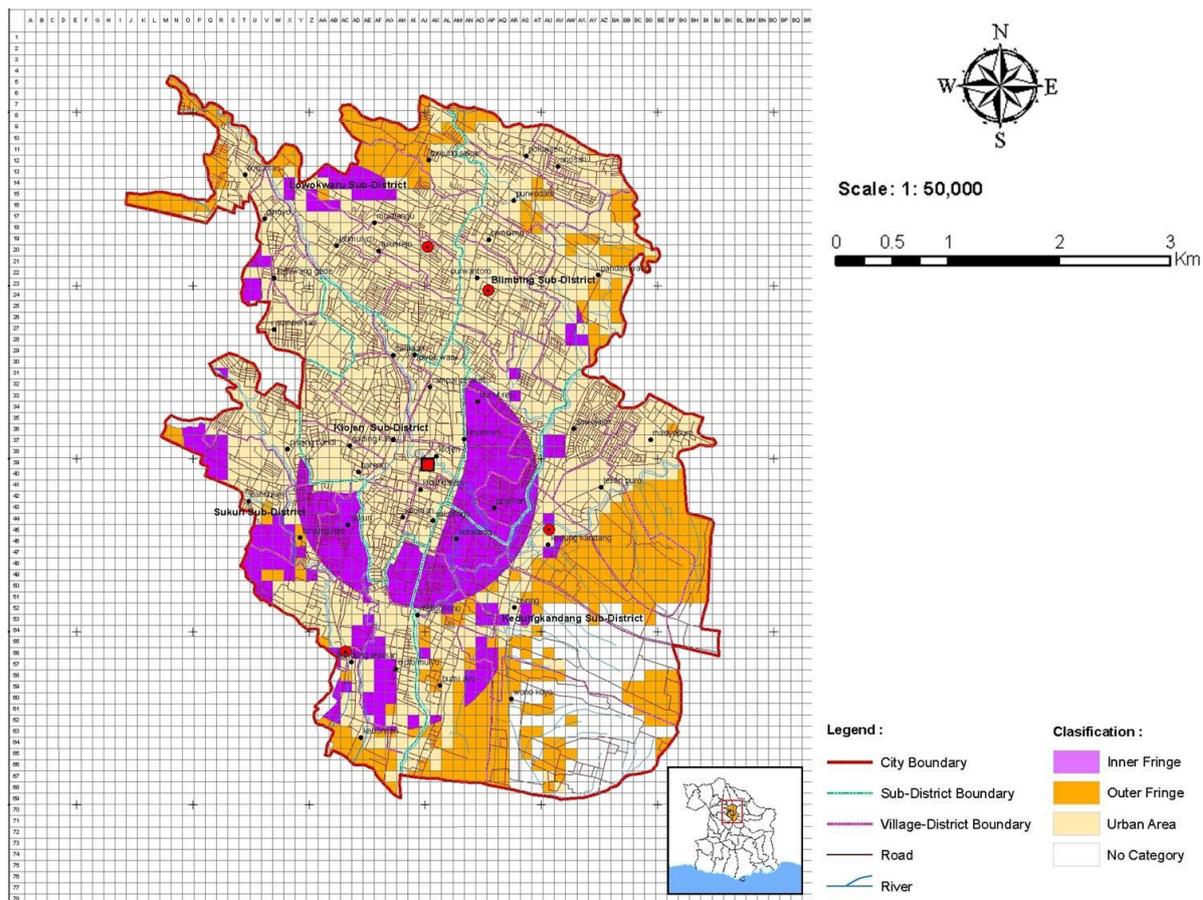
#### 4.6.3. Combination

The total of rural-urban fringe area is 677.47 hectare or 8.30 per cent of the total area of the city. According to the classification, the dominance of the first area is the outer fringe area of 356.59 hectare or 4.37 per cent of the city, and the smallest area is inner fringe area of 320.88 hectare or 3.93 per cent of the city (Table 4.6 and Figure 4.13). This model is divided into 3 parts: urban area, inner fringe, and outer fringe.

**Table 4.6** Identification of rural-urban fringe area based on combination model 2010

No.	Category of morphology	Area	
		(ha)	%
I	Urban area	5045.55	61.80
	Urban fringe area		
II	1 Inner fringe	320.88	3.93
	2 Outer fringe	356.59	4.37
Total of rural-urban fringe		677.47	8.30
Total of the City		8164.33	100

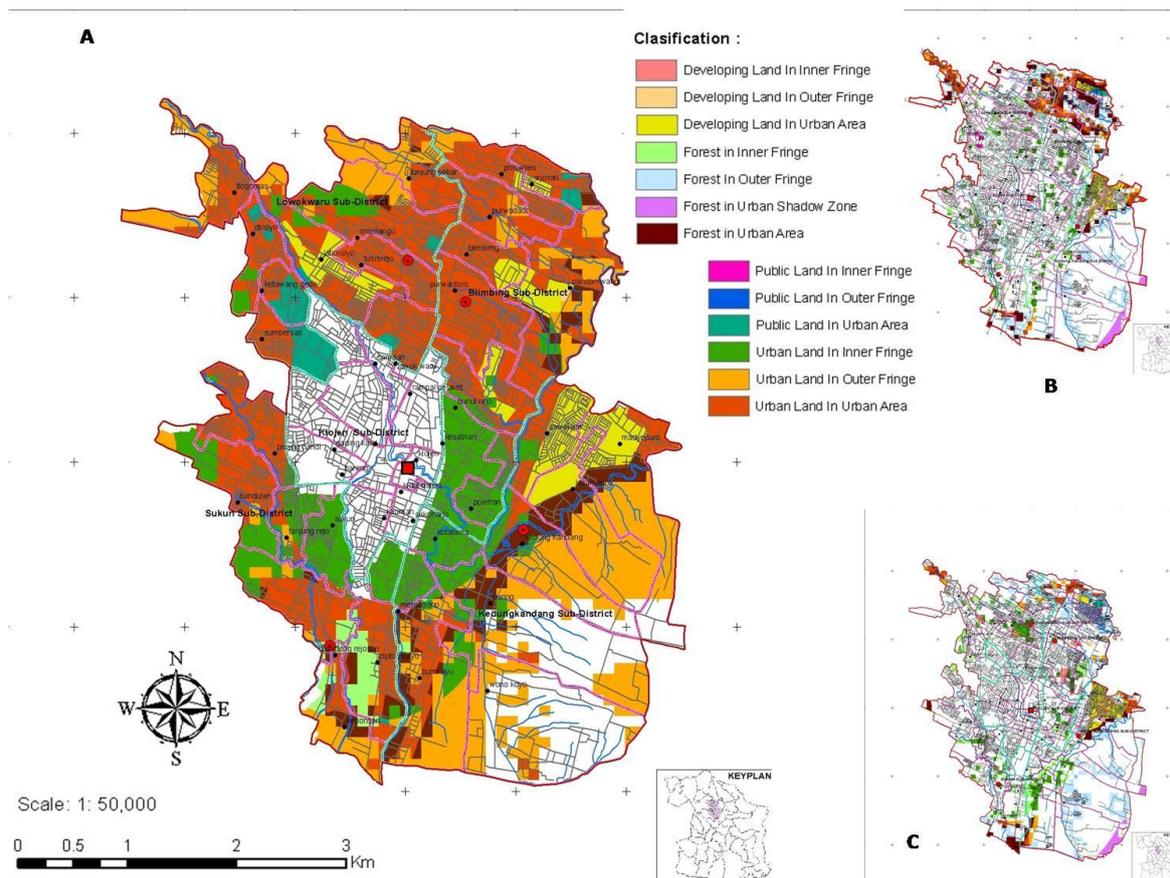
The pattern of land use types is concentric in the inner fringe, outer fringe and urban shadow zone (Figure 4.14). From 1990 to 2010, the total of land-use types changed. Forest and farmland (F) decreased around 87.64 per cent. In contrast, urban land (U) and public land increased around 14.70 per cent and 29.47 per cent (Table 4.7).



**Figure 4.13** Rural-urban fringe area based on combination model in 2010

**Table 4.7** Percentage of land-use types in the rural-urban fringe area based on combination model

Period	Land-use types								Total (ha)
	Forest/Farmland		Urban-land		Public-land		Developing-land		
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	
1990	733.70	58.76	441.73	35.38	59.46	4.76	13.74	1.10	1248.63
2000	338.78	37.12	488.89	53.57	73.50	8.05	11.40	1.25	912.57
2010	90.71	13.39	514.68	75.97	68.98	10.18	3.10	0.46	677.47



**Figure 4.14** The pattern of land-use types in the rural-urban fringe area based on combination model 2010 (a), 1990 (b), and 2000 (c)

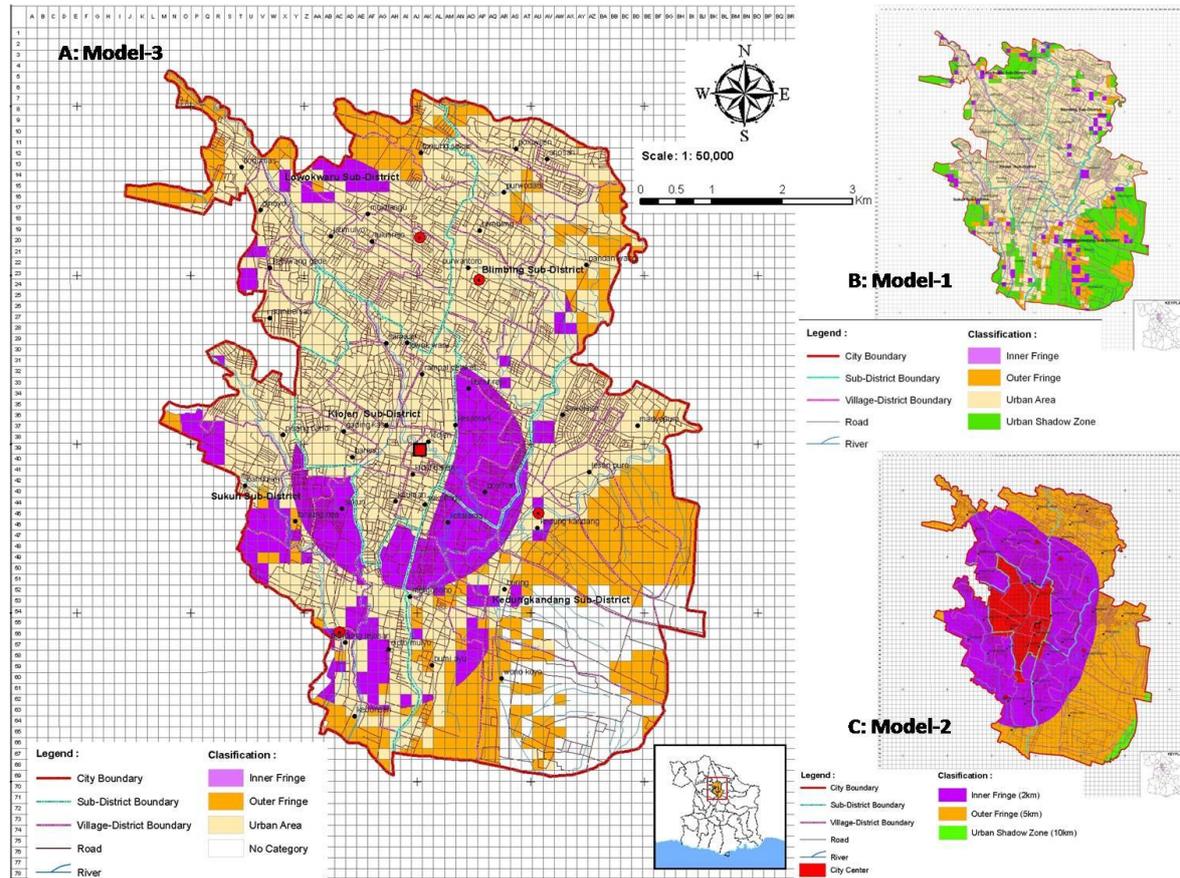
### 4.7 Comparative analysis between three models in the rural-urban fringe

We have demonstrated quantitatively that there are differences in large amounts of the rural-urban fringe area in three models. The total of rural-urban fringe area based on urban-rural land use model is 2734.8 hectare or 33.50 per cent of the total area of the city. Meanwhile, the total rural-urban fringe area based on spatial structure model is 7188.52 hectare or 88.05 per cent of the total area of the city. Then, the total rural-urban fringe area based on combination model is 677.47 hectare or 8.30 per cent of the total area of the city. This can be seen in Table 4.8.

**Table 4.8** Percentage of rural-urban fringe area 2010 by three models

No.	Model	Total of rural-urban fringe areas	
		(ha)	(%)
1	Urban-rural land use model	2734.80	33.50
2	Spatial structure model	7188.52	88.05
3	Combination model	677.47	8.30

Figure 4.15 illustrates that the location of inner, outer, and urban shadow zone on each model is different. The location of inner, outer and urban shadow zone in urban-rural land use model tends to be spread throughout the region (Figure 4.9). We can find the location of the urban shadow zone close to the city center. In contrast, some parts of the inner fringe are located far from the city center, close to rural areas. It is questionable.

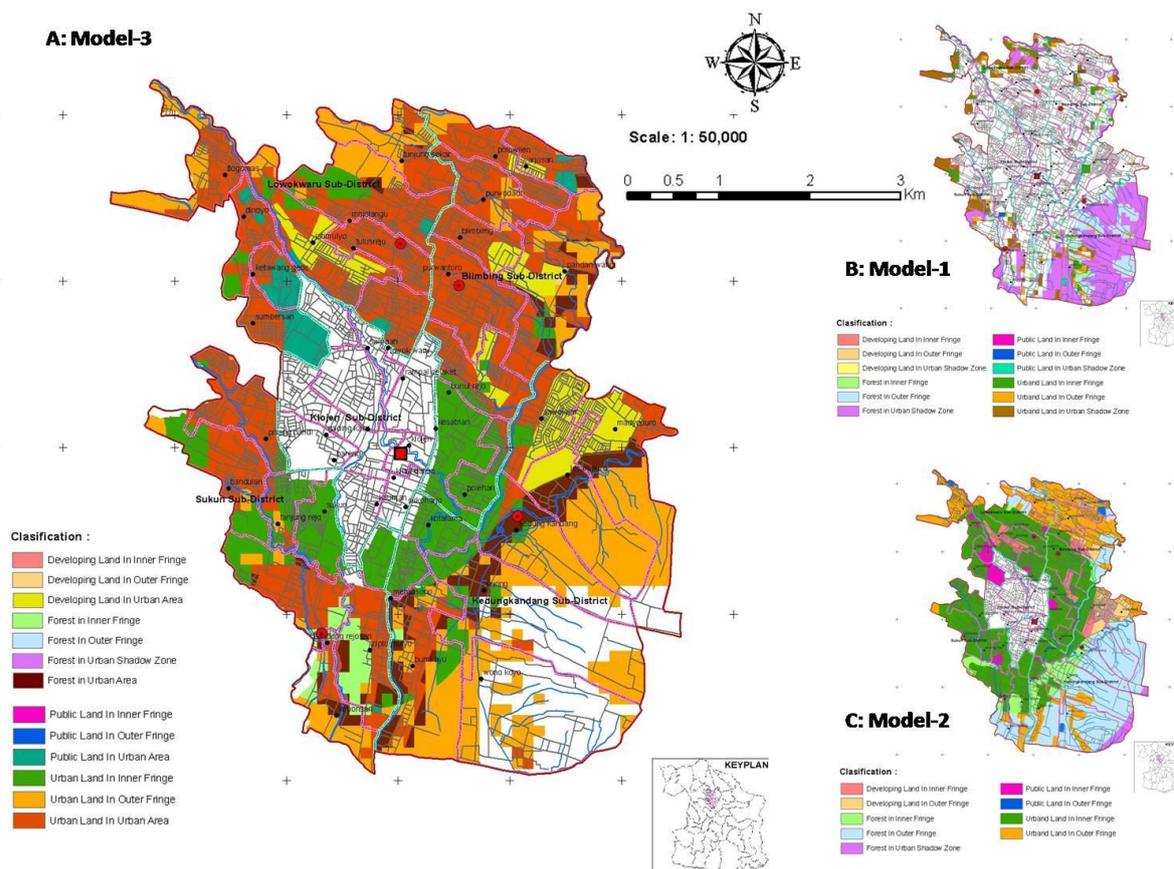


**Figure 4.15** Rural-urban fringe area based on combination model (A), based on urban-rural land use model (B), and based on spatial structure model (C).

As shown in Figure 4.11, the total area of the inner fringe is the biggest at around 3715.16 hectare or 45.50 per cent. The smallest area is the urban shadow zone with 92.81 hectare or 1.14 per cent. This situation is different with the urban-rural land use model. In this model, the total area of the urban shadow zone is the biggest around 1707.96 hectare or 20.92 per cent (Figure 4.9). The spatial structure model determines urban fringe area location based on the distance to the city center. We all know that each city in the world has a different radius and, therefore, we must determine the distance of the urban fringe area to the city center according to the radius of each city. This model is idealistic.

Meanwhile, the combination model used two models: the urban-rural land use model and spatial structure model. Figure 4.13 illustrates that the location of urban fringe areas (inner and outer fringe) is more balanced and reasonable than the other two models. The Outer fringe is the biggest area in this model at around 356.59 hectare or 4.37 per cent. Then, the smallest area is the inner fringe.

Land-use type changes of the three models are shown in Figure 4.16 and Table 4.9 Land-use type in each model changed. Forest and farmland in each model decreased. Urban-land and public land increased. In contrast, urban land in the urban-rural land use model decreased in 2010. This is a weakness of the urban-rural land use model. Furthermore, the total of rural-urban fringe area in the urban-rural land use model and combination model decreased. In contrast, the total of rural-urban fringe area in the spatial structure model did not change. This is a weakness of the spatial structure model.



**Figure 4.16** Land-use types changes in the rural-urban fringe area based on combination model (A), based on urban-rural land use model (B), and based on spatial structure model (C).

It should be underlined that the best model should meet the following requirements:

- (1) The total area of rural-urban fringe should be decreased
- (2) Urban-land and public-land should be increased
- (3) Forest and farmland should be decreased
- (4) No changing domination area in connection with location of inner, outer and urban shadow zone

In the rural-urban land use model, the total area of forest and farmland dropped from 57.16 per cent to 39.94 per cent. The domination area is the urban shadow zone. Urban-land and public-land increased in 2000 and it decreased in 2010. The dominant area changes between the inner fringe and outer fringe. It shows that this model is questionable. It resembles a sprawl.

**Table 4.9** Percentage of land-use types in the rural-urban fringe area based on urban-rural land use model, spatial structure model, and combination model

Model	Period	Land-use types								Total (ha)
		Forest/Farmland		Urban-land		Public-land		Developing-land		
		(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	
Urban-rural land use model	1990	2778.88	57.16	1374.05	28.26	414.43	8.52	294.43	6.06	4861.79
	2000	1713.78	43.17	1654.25	41.67	400.19	10.08	201.89	5.09	3970.11
	2010	1092.2	39.94	1097.3	40.12	424.18	15.51	121.12	4.43	2734.8
Spatial structure model	1990	2656.05	36.95	2698.94	37.55	1357.61	18.89	475.61	6.62	7188.52
	2000	1981.89	27.57	3356.01	46.69	1461.42	20.33	389.20	5.41	7188.52
	2010	982.28	13.66	4155.48	57.81	1772.36	24.66	278.40	3.87	7188.52
Combination model	1990	733.70	58.76	441.73	35.38	59.46	4.76	13.74	1.10	1248.63
	2000	338.78	37.12	488.89	53.57	73.50	8.05	11.40	1.25	912.57
	2010	90.71	13.39	514.68	75.97	68.98	10.18	3.10	0.46	677.47

In the spatial structure model, the total area of forest and farmland decreased from 36.95 to 13.66 per cent. Urban land increased from 37.55 to 57.81 per cent. In this model, the weakness lies in the total area of the rural-urban fringe not changed (Table 4.10). The combination model is better than others. The dominant area of forest and farmland in this model is the outer fringe. Then the dominant area of urban-land and public-land is the inner fringe. There is no change in dominant area in each land use type from 1990 to 2010 (Table 4.10).

To prove that the combination model is better than the others two models, we analysed land-use type changes related to location of rural-urban fringe area in detail. We choose Pandanwangi village in detail (Table 4.11).

Table 4.11 shows that the combination model (model-3) is better than the two other models because it is able to meet all four criteria that have been determined with regard to how to identify rural-urban fringe area location. The weakness of the urban-rural land use model (model-1) is the decrease in the total area of urban land in the rural-urban fringe. Furthermore, the weakness of the spatial structure model (model-2) is that the total area of the rural-urban fringe does not change in any period.

#### 4.8 Discussion and conclusion

The rural-urban fringe area is an important area for a city, other than the city center. If the city center is insufficient for the urban population, then, of course the target of urban development will move to the rural-urban fringe. It is difficult to trace boundaries of rural-urban fringe area clearly because of mixing of urban and provincial properties in an area once. We investigate this problem by comparing result and interpretation of three models with the same data using GIS function. Identification of rural-urban fringe area in each model is different.

The results show that there are differences large amounts of rural-urban fringe areas in three models. The location of inner, outer, and urban shadow zone on each model is different. The location of inner, outer and urban shadow zone in urban-rural land use model tends to be spread throughout the region. We can find the location of the urban shadow zone close to the

city center. In contrast, some parts of the inner fringe are located far from city center, close to the rural areas. It is often questionable. In addition, the urban-rural land use model has a weakness: urban-land in rural-urban fringe area is unstable. Furthermore, the spatial structure model determines rural-urban fringe area location based on the distance to the city center. We all know that each city in the world has a different radius and, therefore, we must determine the distance of rural-urban fringe area to the city center according to the radius of each city. This model is idealistic. On the other hand, the weakness of the spatial structure model is the total area of rural-urban fringe does not change in each period.

The combination model is an appropriate model to identify rural-urban fringe area location compared with the other two models because the rural-urban fringe area location (inner and outer fringe) is more balanced and reasonable than the other two models. The combination model can meet the four requirements related to identification of rural-urban fringe area location. The authors hope that this study will give a new model that can be used by planners to identify rural-urban fringe area location. It is important for rural-urban planning if we want to make an appropriate concept and strategy to anticipate urban developments in the rural-urban fringe area.

**Table 4.10** Percentage of land-use types changes in urban fringe area by three models

Model	Percentage of land-use type changes (%)											
	F			U			P			D		
	1990	2000	2010	1990	2000	2010	1990	2000	2010	1990	2000	2010
Urban-rural land use model	57.16	43.17	39.94	28.26	41.67	40.12	8.52	10.08	15.51	6.06	5.09	4.43
Spatial structure model	36.95	27.57	13.66	37.55	46.69	57.81	18.89	20.33	24.66	6.62	5.41	3.87
Combination model	58.76	37.12	13.39	35.38	53.57	75.97	4.76	8.05	10.18	1.10	1.25	0.46

**Table 4.11** Percentage of land-use types changes in Pandanwangi by three models for 1990, 2000 and 2010

Classification	Urban-rural land use model						Spatial structure model						Combination model						
	'90		'00		'10		'90		'00		'10		'90		'00		'10		
	F	U	F	U	F	U	F	U	F	U	F	U	F	U	F	U	F	U	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
IF	57	43	60	28	40	41	81	19	29	56	5	65	79	21	48	37	2	95	
OF	65	34	74	19	51	39	61	39	50	41	36	55	68	32	63	36	33	66	
USZ	0	17	33	21	52	48	0	0	0	0	0	0	0	0	0	0	0	0	
UF	74	26	57	23	48	43	68	32	42	46	25	59	74	26	54	37	19	80	
Total of UF	269.38		266.32		107.94		398.25		398.25		398.25		398.25		345.27		183.03		

#### 4.9 References

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## CHAPTER 5

# PHYSICAL CHANGE OF RURAL-URBAN FRINGE AREA BASED ON COMBINATION MODEL

### 5.1 Introduction

There are many studies about rural settlement, such as Cloke and Edwards (1986) put forward the concept of an index of rurality based upon data from the 1981 census. Everson and Fitzgerald did a detailed study of the services provided by both rural and urban settlements in part of East Anglia, using a very wide range of data resources. Carter (1992) carried out a detailed analysis of settlements in Pembrokeshire in SW Wales using data from what was then the Dyfed Country Council. Schoenauer (1981) places rural settlements and house types into six different categories as being like an evolutionary hierarchy of dwelling types of dwellings from the most mobile shelters to the most permanent of buildings. Rural settlement is that which is located in the countryside as opposed to a broadly urbanized area (Michael Hill, 2003). This research make analysis about 'fringe-settlements'. This is slightly different from 'rural-settlements'. Fringe-settlements are located in the rural-urban fringe area and it was built by housing-developers.

The rural-urban fringe 'is the zone of transition in land use, social and demographic characteristics, lying between (a) the continuously built-up urban and suburban areas of the central city, and (b) the rural hinterland, characterized by the almost complete absence of non-farm, dwellings, occupations and land use,...'(Pryor, 1968). The rural-urban fringe area is the most important area for the city because if city centre is insufficiency, the target of urban development will move to rural-urban fringe area. Many urban population prefer to live in the rural-urban fringe areas, as well as housing developers to build housing there due to high demand. This is caused by several things, such as land is cheaper, there is less traffic congestion and pollution, there is easier access and a better road infrastructure, and there is a more pleasant environment with more open space. Many developers are competing with construction in the rural urban fringe areas because they want to use the land in the region for several purposes, such as housing developments as urban sprawl continue, science and business parks, hyper-markets and superstores, office developments, hotels and conference centers.

If urban development in the area of rural-urban fringe continues to be left uncontrolled, it would be dangerous for the survival of the rural-urban fringe area. Because it will cause some problems in the rural-urban fringe areas such as large area of the rural-urban fringe maybe lost, buildings maybe out of character with existing rural buildings, villages become sub urbanized, traffic is likely to increase, there may be some noise or pollution. Thus, the objective of this research is to improve the policy of fringe-settlements development in the rural-urban fringe area. The research method of this study is a combination of quantitative methods with qualitative methods. Quantitative methods is used to determine whether there are physical changes resulting from the development of fringe-settlements in rural-urban fringe areas, while the qualitative methods is used to determine patterns of space utilization and the factors that change the spatial patterns. Firstly, we identify the influence of fringe-settlements to physical change in the rural-urban fringe area. Secondly, we analyze the pattern of development of the region of space around the fringe-settlements. Thirdly, we

examine the causative factors of physical change in rural-urban fringe area. Thus, the outcome can be used as input for the city government in creating new policy related to the development of fringe-settlements in the rural-urban fringe area.

## **5.2 Settlements, real estate, and real property in Indonesia**

There are several definitions of residential, such as: ‘Undang-Undang’ no. 4/1992 on residential and settlements: Residential is a group house that serves as a neighborhood or residential environment, which equipped with infrastructure and environmental facilities. The instructions in the planning of the urban housing area (Department of Public Works, 1987:P.4), residential environment is a group of houses with infrastructure and environmental facilities.

Thus, the definition of housing or dwelling is not simply a problem of meaning or physical appearance. In contrast, it related to the usefulness of a non material. The principal is both social and economic convenience, security guarantees to homeowners or his/her environment. In addition, social and economic problems associated with a variety of facilities inventory, such as the housing close to the schools, hospitals, shopping centers, highways and workplace, where it can provide convenience for the owners.

According to Jeffrey D. Fisher (1991:54), real estate is a plot of land identified, including support facilities (improvements). Real property is the interest, benefits and privileges attached to any real estate because of the ownership. Real property consists of the rights that have the value or power legally and consists of three components, namely: land, objects that are permanently attached to the land, and legal issues inherent in the land, which can't be transferred by law.

In fact, Indonesian People's considers real estate and real property are two things in common but theoretically two things are different. Real property is the ownership of a property, while real estate is a plot of land or object that is attached on it.

### **5.2.1 The house as primary needs for human**

In accordance with the instructions in the planning of the urban housing areas (Department of Public Works, 1987, p.34), a residential area must meet the several requirements as follows: accessibility, compatibility, flexibility, and ecology.

The people have always tried to utilize the space around it for the benefit of survival. The purpose of housing development is to meet the demand for dwelling as one of the basic needs for humans. In addition, the house is a place of shelter and a rest as well as a place for residents in their daily activities. The requirements related to housing development purposes, namely that every person can occupy a healthy housing, to support the continuation and improvement of its social welfare.

### **5.2.2 The provision of housing development**

According to the three ministerial decision no. 648-348/1992, no. 739/KPTS/1992, and no. 09/KPTS/1992 that the development of housing and settlements are directed to realize the area and residential neighborhoods and settlements with a balanced residential environment, including a simple house, middle house, and a mansion by comparison and certain criteria. It is intended to accommodate harmoniously between groups of people from various professions, levels of economic and social status.

Specific comparisons referred to above is the ratio of the number of the simple house, medium house, and mansion, at 6 or more, 3 or more, and 1. For example, the construction of medium house as many as 900 units or more at each location are required to build two units of the simple house for every 1 unit of medium house which can be built at another location but remained in the same city. The construction of 100 units or more mansion at any location required to build simply house of 6 units per 1 mansion and required to build middle houses of 3 units in others location.

The certain criteria in the construction of housing as referred to the above are as follows:

- Simple house is a house built with a land area between 54 m<sup>2</sup> to 200 m<sup>2</sup>, and construction cost per m<sup>2</sup> does not exceed the unit price per meter highest for the construction of C-class government housing agencies regulations.
- Middle house is a house built with an area of land between 200 m<sup>2</sup> to 600 m<sup>2</sup> with a construction cost per m<sup>2</sup> among the highest unit price per m<sup>2</sup> for the residential development of government agencies class C to class A will apply.
- Luxury house is a house built with an area of land between 600 m<sup>2</sup> to 2000 m<sup>2</sup> with a construction cost per m<sup>2</sup> over the highest unit price per m<sup>2</sup> for the residential development of government agencies class A will apply.

### 5.3 Factors that affect property values

Factors that influence the value of a property are as follows:

**Location:** The value of a property is determined from the location of the property (Hodgkins, 1982:74). Then, the strategic location of the property that the product will be more attractive the interest of consumers (Wurtzebach and Miles, 1994:10). This related to accessibility or distance possible achievement of the region and to the region which can provide a convenience for residents. The strategic location will ensure safe and profitable investment. Check also the whether the location is safe of the road widening, construction of public facilities and others. The lay of the land which height is lower of the road should be avoided.

**Physical:** Several basic physical characteristics of land to be considered are as follows: size, shape, frontage, width, depth, topography, and other attributes such as drainage, pollution, climate and view.

**Environment:** Environment is a system which is the unity of space with all the objects, power, and circumstances (Soerjani, 1987). Environment is the climate, topography, transportation systems, and location factors that affect the value of a property (Fisher, Martin, and Mosbaugh, 1991).

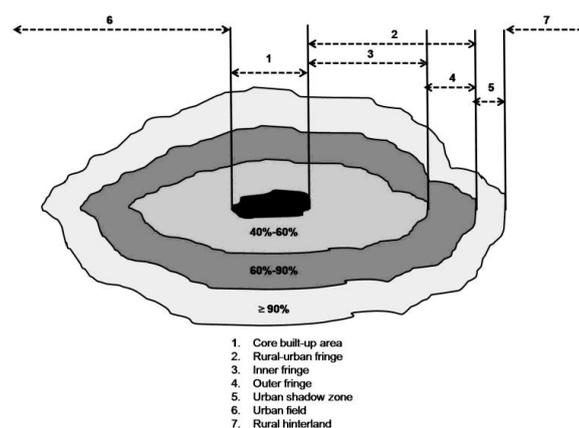
### 5.4 Land-use and rural-urban fringe

There are many studies about land-use changes at the national scale as well as smaller scale, such as cities or villages (Himiyama, 1994, 1998; Hoshino, 2001; Verbist et al., 2005). These studies have regarded a region as an aggregated system which can be used to estimate only the amount of land-use change (Rustiadi and Kitamura, 1998). Braimoh and Onishi (2007) identified the factors responsible for residential and industrial/commercial land development in Lagos. They classified land use into four: (1) Residential, (2) Industrial/commercial, (3) Non-urban, and (4) Water.

T.L. Smith's (1937) discussion of the "urban fringe" around Louisiana marked the first use of this term signifying "the built-up area just outside the corporate limits of the city". Kurtz and Eicher (1958) differentiate between "fringe" and "suburb" while Wissink (1962) defines "fringe", "suburbs", "pseudo-suburbs", "satellites" and "pseudo-satellites". A number of writers have described different types of suburbs, some of which could be synonymous with the "fringe" of another research worker.

The rural-urban fringe is the landscape located just outside of established cities and towns, where the countryside begins. The fringe characterized by diversity in land uses, with many areas in continuous transition (Friedberger, 2000; Sullivan and Lovell, 2006).

The rural-urban fringe area location is determined by the proportion of urban land-use functions and residential properties, the proportion of agricultural land-use, and distance bands (Agustin and Kubota, 2010). The basic research division of rural-urban fringe area location is divided into two sub-zones. The first is inner fringe, in which non-agriculture land began to be dominant. The built-up environment and the natural environment are balanced (40 per cent to 60 per cent of agricultural and conservation areas). It covers an area of around 2 kilometers from the city center. The second sub-zone is the outer fringe, in which land use is dominated by provincial features (60 per cent to 90 per cent of agricultural and conservation areas). It covers an area from more than 2 kilometers and up to 5 kilometers (Figure 5.1). Measurement of the distance bands of each sub-zone calculated from the total radius of the city.



**Figure 5.1** Combination model (Agustin and Kubota, 2010)

## 5.5 Research method

In this research, we used a combination of quantitative with qualitative methods. Quantitative method is used to determine whether there are physical changes resulting from the development of fringe-settlements in the rural-urban fringe areas, while the qualitative method is used to determine patterns of space utilization and the factors that change the spatial patterns. We also used combination model to identify rural-urban fringe area location clearly. This model is determined by the proportion of urban land use functions, residential properties and the proportion of agricultural land use. It was also calculated based on the distance bands and square grid (Figure 5.1).

Secondary data includes the physical data, population data such as population/household in the study area, housing data, physical data regions and administrative data region as well as other supporting data. Primary data are needed in this study will be obtained by conducting field surveys to identify the effect of fringe-settlements development to the physical changes in the rural-urban fringe area and also by using the questionnaire to gather information from the respondents.

Primary data and secondary data were analyzed quantitatively using frequencies and cross tabulation analysis which aims to find out how the relationship or the influence of each variable to other variables in conjunction with the research, which aims to determine the effect of fringe-settlements development on the physical changes in the rural-urban fringe area.

### 5.5.1 Study area

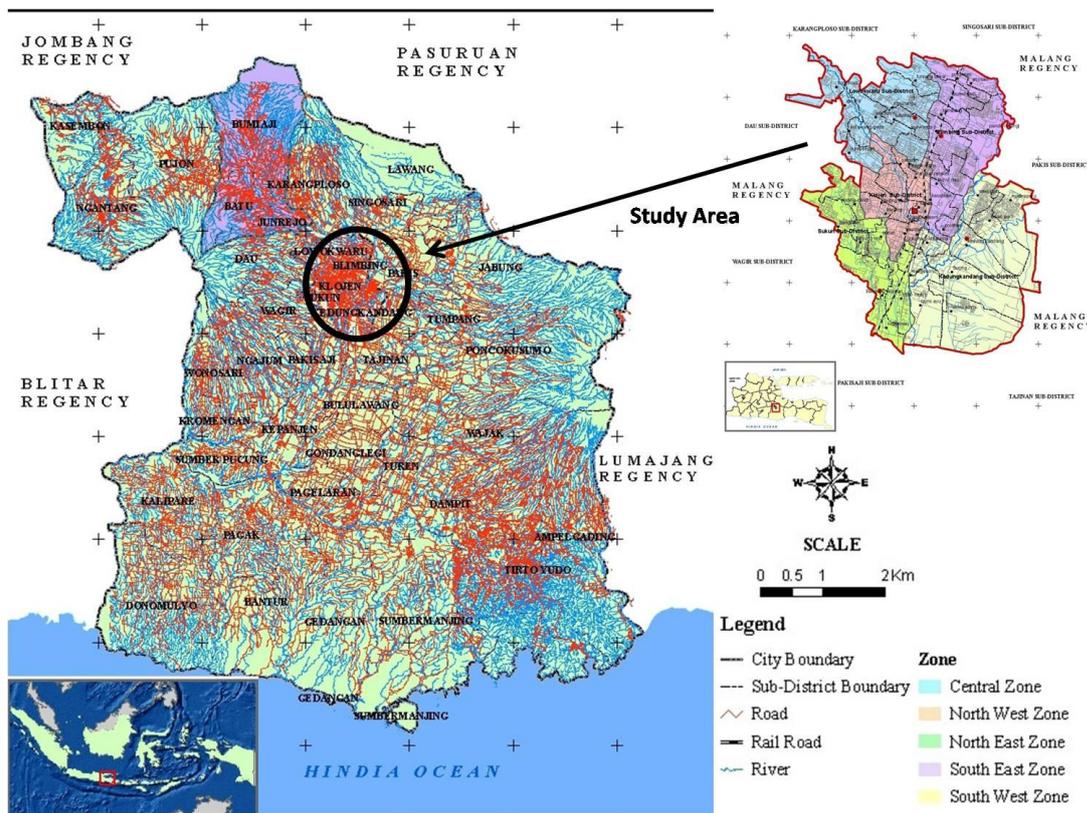
In this study, the location of the study is the rural-urban fringe in the City of Malang, Indonesia. In the administrative regions used as study sites can be seen in the following table:

**Table 5.1** Administrative Area of Study Sites

Sub-district	Information
1. Blimbing	Only included in the study area (Rural-urban fringe area)
2. Lowokwaru	
3. Sukun	
4. Kedungkandang	

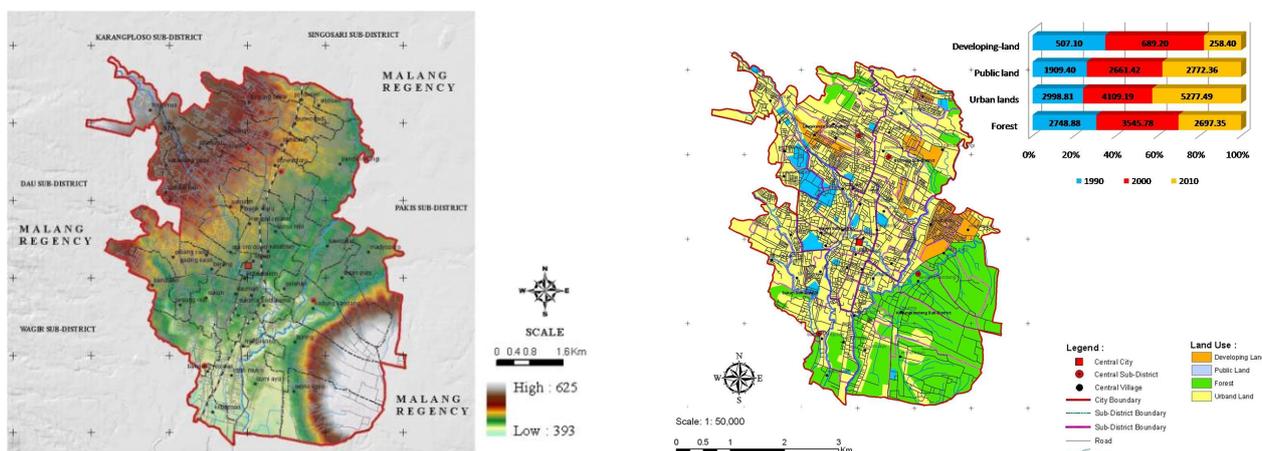
The present study selected 4 sub-districts and 23 villages, which have a total area of about 8164.33 hectare (Figure 5.2). In 2010, the study area's population was 816,637 inhabitants (Statistic of Malang City, 2009). The study area located between 112.06°-112.07° East longitude and 7.06°- 8.02° the South latitude.

Fringe-settlements in the City of Malang spread in several areas such as in the Sub-district of Blimbing, the Sub-district of Lowokwaru, the Sub-district of Sukun, and the Sub-district of Kedungkandang. Fringe-settlements were built in the area of paddy field with a location close to the highway or close to the village (Kampung). The distance between fringe-settlements is usually not so far, especially the location in the paddy field, as happened in the Sub-district of Kedungkandang. The emergence of fringe-settlements in the new location will trigger the establishment of other fringe-settlements, so that the rural-urban fringe area became crowded. Kedungkandang Sub-district and Sukun Sub-district are a fairly fertile agricultural land, with the percentage area of mostly farmland. There are many fringe-settlements built in the Sub-district of Kedungkandang and Sub-district of Sukun means that agricultural land decreased.



**Figure 5.2** The location of study area and the study area showing the four sub-districts and their boundaries

The study area has a topography which most (96.3 per cent) flat with slope 0-15 per cent and height of 380-667 meters above sea level (Figure 5.3)



**Figure 5.3** The digital elevation model of the study area and the distribution of the four types of land-use in the study area for 2010

Fringe-settlements built in the 1990s are the fringe-settlements with large areas, and many have a number of housing units. In contrast, fringe-settlements built after 2000 have a tendency as the fringe-settlements with the area that is not so wide and has a number of housing units less, between 15 to 30 houses. Most of the new fringe-settlements do not have public facilities, such as parks and drainage. The distance between the 'fringe-settlements'

with each other sometimes not so far away, so there is a tendency that the longer the rice fields located between two 'fringe-settlements' will run out because there is no other option for farmers than selling their land to developers. Condition of 'fringe-settlements' in the study area can be seen in Figure 5.4.



Fringe-settlements 'Puri Kartika Asri' in Pandanwangi Village



Fringe-settlements 'Bumi Purwantoro Agung'



Fringe-settlements 'Bandulan Permai 3' in Bandulan Village



Fringe-settlements 'Kartika Sari 1'

**Figure 5.4** Fringe-settlements in the rural-urban fringe area

### 5.5.2 Data collection

In this study, the object of the research is land use in 23 villages (before and after the construction of fringe-settlements). Changes in land area and houses in 23 villages are experiencing changes in function of home into commercial. The unit of analysis is the homeowners around the fringe-settlements, physical home business, come-in population who live in the fringe-settlements as well as the surrounding environment (other facilities that support). Furthermore, in this study are used as respondents are the owners of 'home business' and homeowners who live in the fringe-settlements. If the location of 'home business' is far

from the location of 'fringe-settlements', it is not used as respondents. Only the owners of 'home business' who live in the area of research are used as respondents.

### 5.5.3 Questionnaire

Data regarding come-in population in fringe-settlements and the owners of home-business have been collected using a questionnaire that was distributed in September 2009 and July 2010. The region of population sample was taken in the rural-urban fringe area which has been determined using the technique of Non-probability Sampling. Respondents were selected using purposive sampling method where respondents are not determined in advance. The population in the study is the owners of home-business and come-in population who live in 'fringe-settlements' of the rural-urban fringe area. Then, the number of samples was determined after the discovery of the location of rural-urban fringe areas. This research collected 202 the owners of home-business and 202 come-in population that were required to fill in the questionnaire.

The questionnaire divided into two parts. The front page of this questionnaire is the introduction to the respondent that explains the purpose, the person in charge, and the contact address. The first part for the owners of home-business, we ask their reason to change their home into home-business. It consists of 44 general questions. The second part for come-in population, we ask their job and their reason come to rural-urban fringe area. It consists of 20 general questions. The descriptive statistics of the respondents are provided in Table 5.2.

**Table 5.2** General characteristics of respondents (the owners of home-business; n=202)

No.	Characteristics	Statistics
1	Sex	Male (58.1%), Female (41.4%)
2	Age	21-30-year-olds (2.5%), 31-40-year-olds (30.5%), 41-50-year-olds (35%), >50-year-olds (31.5%)
3	Place of living	Blimbing (18.7%), Lowokwaru (15.8%), Sukun (21.7%), Kedungkandang (43.3%)
4	Family members	1 (9.9%), 2 (56.2%), 3 or more members (33.5%)
5	Last education	Senior High School (8.9%), Diploma (25.6%), Undergraduate (63.5%), Post graduate (1.5%)
6	Type population	Indigeneous (94.6%), immigrant (5%)
7	Start time settled	Before 1990 (94.6%), in 1990 (4.9%)
8	Reason live	Indigeneous people (94.6%), Job/business (3.4%), Other (1.5%)
9	Primary job	Farmer (6.9%), Merchant (13.8%), Public servant (51.7%), Army/police (5.9%), Retired (6.9%), Entrepreneur (8.4%), Other (5.9%)
10	Second job	Farmer (2.5%), Merchant (68%), Entrepreneur (4.9%), None (6.9%), Other (17.2%)
11	Type of land-use before 1990	Paddy field (72.9%), Moor (23.2%), Other/residential and paddy field (3.4%)
12	Type of land use in 2010	Residential/home only (17.2%), Other/residential and paddy field (2.5%), Home-business (79.8%)
13	Size of whole building	201-300m <sup>2</sup> (22.2%), 301-400m <sup>2</sup> (38.4%), 401-500m <sup>2</sup> (32%), >501m <sup>2</sup> (6.9%)
14	Size of building for business	101-200m <sup>2</sup> (85.2%), 201-300m <sup>2</sup> (14.3%)
15	Size of building in 1990	0-100m <sup>2</sup> (67.5%), 101-200m <sup>2</sup> (22.7%), 201-300m <sup>2</sup> (5.9%), 301-400m <sup>2</sup> (3%), 401-500m <sup>2</sup> (0.5%)

To be continue

Continue of Table 5.2

No.	Characteristics	Statistics
16	Size of building in 2010	101-200m <sup>2</sup> (39.4%), 201-300m <sup>2</sup> (38.4%), 301-400m <sup>2</sup> (17.2%), 401-500m <sup>2</sup> (4.4%)
17	Size of yard in 1990	0-100m <sup>2</sup> (3.9%), 101-200m <sup>2</sup> (37.4%), 201-300m <sup>2</sup> (36.5%), 301-400m <sup>2</sup> (19.7%), 401-500m <sup>2</sup> (2%)
18	Size of yard in 2010	0-100m <sup>2</sup> (66%), 101-200m <sup>2</sup> (29.1%), 201-300m <sup>2</sup> (3.9%)
19	Function of building in 1990	Residential/home only (58.6%), Home-business (3.4%), Shops (0.5%), Other/residential and paddy field (37.1%)
20	Function of building in 2010	Residential/home only (20.2%), Home-business (78.8%), Shops (0.5%)
21	Status of building	Own property (60.6%), Inheritance (36.5%), Other (2.5%)
22	Changes/additions of building	Yes (77.3%), No (22.2%)
23	Reason of building changes	New family members (3%), Business (67.5%), Other (6.9%), None (22.2%)
24	Start time of business	Before 1990 (2.5%), 1990-2000-years (60.6%), 2001-2010-years (14.8%), Other (21.7%)
25	Relationship between changes the function of building and the construction of fringe-settlement	Yes (79.3%), No (19.2%)
26	The existence of fringe-settlement influence on land use pattern	Yes (78.8%), No (20.7%)
27	Significant change in land use	Yes (80.8%), No (18.7%)
28	Changing land use caused by the existence of fringe-settlement	Yes (79.8%), No (19.7%)
29	Public facilities	Better (78.3%), Medium (21.2%)
30	Quality of neighborhood road in 1990	Good (8.9%), Medium (80.8%), Bad (9.9%)
31	Quality of neighborhood road in 2010	Good (67.5%), Medium (32%)
32	Waste service in 1990	Good (35.5%), Medium (49.8%), Bad (14.3%)
33	Waste service in 2010	Good (43.8%), Medium (2.5%), Bad (53.2%)
34	Source of water in 1990	PDAM (25.1%), Non PDAM/drilled (74.4%)
35	Source of water in 2010	PDAM (41.4%), Non PDAM/drilled (58.1%)
36	Quality and Quantity of PDAM in 1990	Good (16.3%), Medium (10.8%), Bad (5.4%), Other (67.0%)
37	Quality and Quantity of PDAM in 2010	Good (29.6%), Medium (11.8%), Bad (1%), Other (57.1%)
38	Initial investment for business	1-5-million (50.7%), >5-10-million (28.1%), >10-20-million (14.3%), more than 20-million (6.4%)
39	Environmental health in 1990	Good (35.5%), Medium (64%)
40	Environmental health in 2010	Good (40.4%), Medium (5.9%), Bad (53.2%)
41	Layout of building in 1990	Good-layout (81.8%), Not good-layout (17.7%)
42	Layout of building in 2010	Good-layout (45.3%), Not good-layout (54.2%)
43	Electric power needs in 1990	450-VA (37.4%), 900-VA (58.6%), 1300-VA (3.4%)
44	Electric power needs in 2010	450-VA (1.5%), 900-VA (6.4%), 1300-VA (91.6%)

## 5.6 Land-use changes

The result of analysis has been conducted on land-use change in the region around the 'fringe-settlements': it is known that the area of paddy field, moor and vacant land is designated for 3040.89 hectare in 1990, and was reduced by 2215.98 hectare in 2000. Furthermore, it reduced again by 1482.71 hectare in 2010. While, the area of 'fringe-settlements' in rural-urban fringe areas increased from 2621.36 hectare in 1990 to 2947.16 hectare in 2000 and it increased to 3344.36 hectare in 2010 (Table 5.3). Changes in land use of paddy fields, moor, and the vacant land designated on the land use change map look of the largest in the Bandulan village and Pandanwangi village particularly in 'Kampung Jambangan' and 'Kampung Senokembang' directly adjacent by Griya Asri Pandanwangi as 'fringe-settlements'. For more details can be seen in Figure 5.5 (Map of land-use change).

**Table 5.3** Land Use Type in the Study Area around the Fringe-Settlements

Function	Area (Ha)						Changes from 1990 to 2010	
	1990	%	2000	%	2010	%	Ha	%
1. Paddy-field	1001.05	12.26	838.89	10.27	526.86	6.45	474.19	5.81
2. Moor	1532.74	18.77	1057.89	12.96	773.45	9.47	759.29	9.3
3. Dwellings	2621.36	32.10	2947.16	36.10	3344.36	40.96	723	8.86
4. Vacant-land	507.10	6.21	319.20	3.91	182.40	2.23	324.7	3.98

In doing research on the influence of 'fringe-settlements' to changes in land use, then that becomes the basis for the setting is changed or fixed, whether there is any change to land use. The analysis in this study aims to determine the relationship between the land-use before and after the construction of the 'fringe-settlements' in the rural-urban fringe areas. The relationship or the linkage analysis based on the assumption that the land use in 2010 (after the construction of the 'fringe settlements') changes instead of land use in 1990 (before the construction of the 'fringe-settlements'). To support or test this assumption is necessary calculations through cross tabulation. The calculations using the cross tabulation show that the land use before the construction of the fringe-settlements has relationship with the land use after the construction of the fringe-settlements. This is proved by value for Chi-Square (Count) with the each degree of freedom (degree of freedom = 4) is greater than Standard Chi-Square (Table), namely: Chi-Square (Count) = 50.234 more than Chi-Square (table) = 9.49, at 95 per cent confidence level (level of significance 0.05).

**Table 5.4** Changes of Land-use Types before and after the Construction of the Fringe-Settlements in the Rural-Urban Fringe Areas

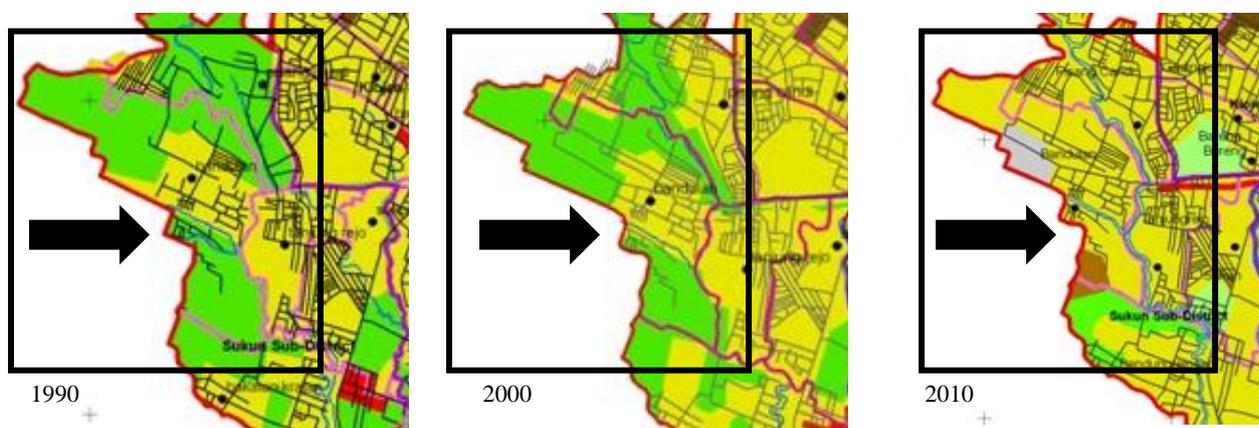
Type of land use	Fringe-Settlements			
	Before		After	
	f	%	f	%
Paddy field	148	72.9	0	0
Moor	47	23.2	0	0
Residential only	0	0	35	17.2
Residential and paddy field/moor	7	3.4	5	2.5
Home-business	0	0	162	79.8
Total	202	100	202	100
<b>Chi-Square</b>			50.234	
DF	4			

Table 5.4 shows that the majority of land-use in 1990 (before the construction of the 'fringe-settlements') is paddy field of 72.9 per cent but in 2010 (after the construction of the 'fringe-settlements') had the addition, which is more in the residential and business of 79.8 per cent. While, 72.9 per cent of land use is paddy field in 1990, turned out in 2010 as much as 79.72 per cent of land use into home-business and 18.91 per cent of residential (home only). Then, 23.2 per cent of land use is moor in 1990. It changes to be residential of 14.89 per cent and home-business of 85.1 per cent (Table 5.5).

**Table 5.5** Type of land use before 1990 \* Type of land use in 2010 Cross-Tabulation

		Type of land use in 2010			Total
		Residential/ home only	Residential and paddy field/moor	Home- business	
Type of land use before 1990	Paddy field	28	2	118	148
	Moor	7		40	47
	Residential and paddy field/moor		3	4	7
Total		35	5	162	202

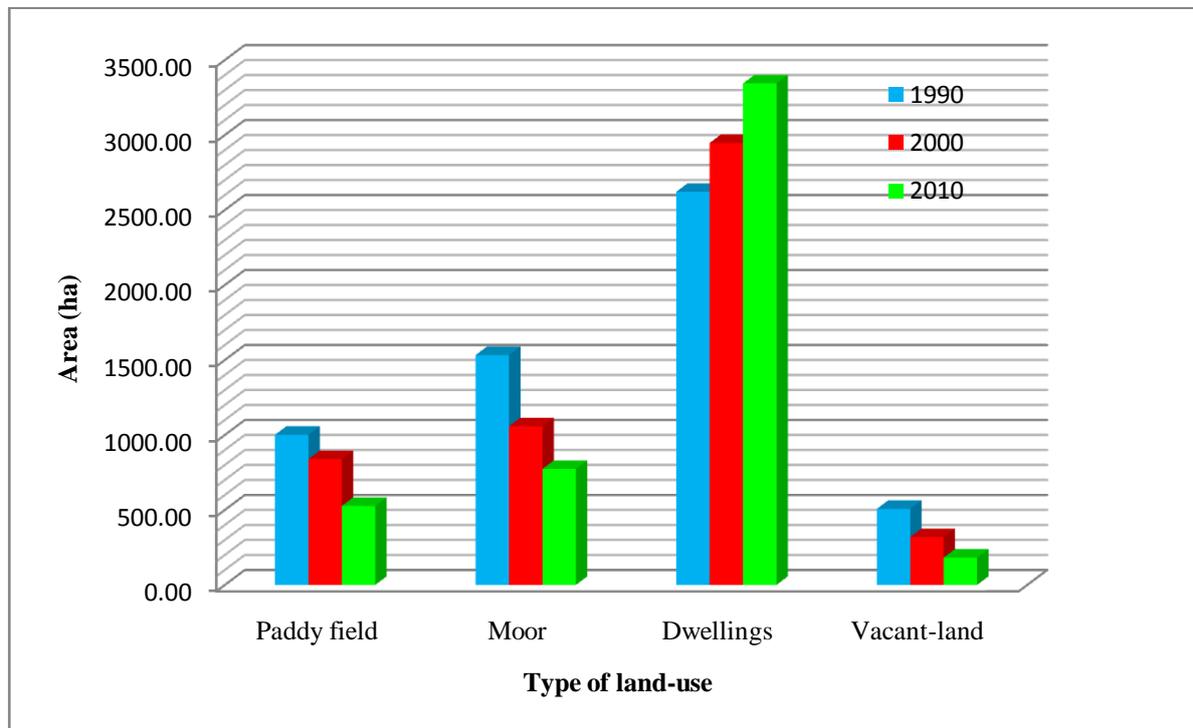
Land use change is also due to the addition of several new roads connecting fringe-settlements with the area around the rural-urban fringe. Existing roads in the area around the fringe-settlements throughout 36.26 kilometers in 1990. There is the addition of roads throughout 10.92 kilometers in 2000, and there is also the addition of roads throughout 12.84 kilometers in 2010. This means that the length of roads in 2000 to 47.18 kilometers, and in 2010 to 49.1 kilometers.



**Figure 5.5** Land-use change from paddy field to settlements in the study area: Paddy field ■  
Settlements ■

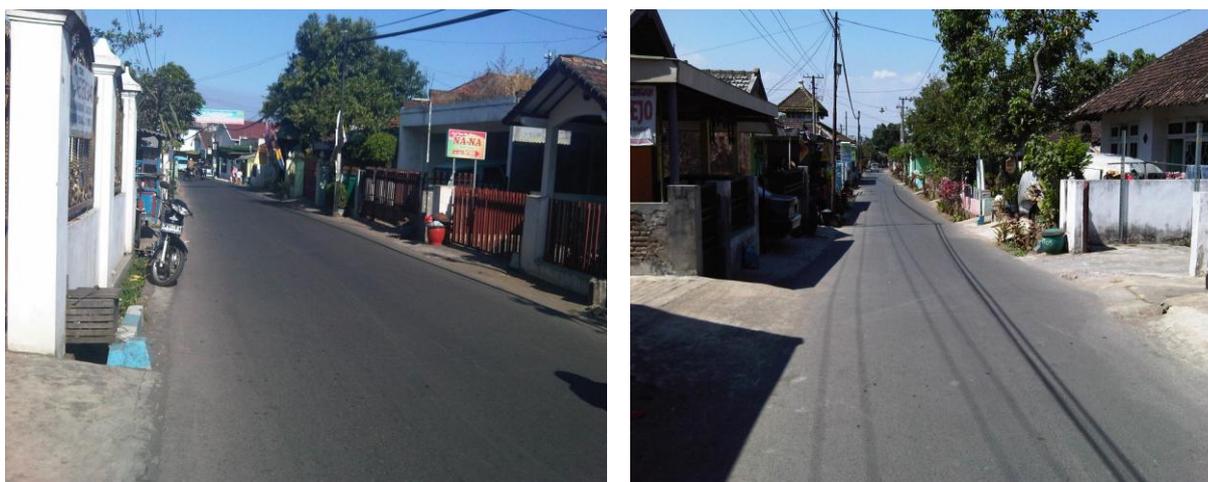
Furthermore, based on the data of the land-use change and analytical results map with an overlay between the built-up map in 1990 with the built-up map in 2000, it known that the dominant direction of physical development, as reflected by changes in land use is to the west, south and to the north caused the presence of dynamic forces, especially centrifugal force, as suggested by Yunus (Colby, 1994). Colby mentioned that the centrifugal force is the force that causes the movement of population and urban functions from the inside of the city to the outside.

In order to simplify read the level of land use change are presented in graphical form below:



**Figure 5.6** Land-use types in 1990, 2000, and 2010

Moreover, other factors that led to strength attraction of the physical development of the area around the fringe-settlements to the West and the South is the influence of transportation routes that connect the rural-urban fringe area with 'fringe-settlements' (Figure 5.7). This condition is in accordance with the opinion expressed by Sujarto (1989) which states that one of the factors to determine the development and growth of a city/region such as orientation and movement patterns of the population.



**Figure 5.7** Asphalt-roads connecting dwellings of rural-urban fringe area with fringe-settlements



**Figure 5.8** Land-use changes in the rural-urban fringe area from paddy field into fringe-settlements in 2010

Comparison of state of rural-urban fringe area in the period before (1990) and after (2010) the construction of the 'fringe-settlements' as follows:

**Table 5.6** Comparison of State of Rural-Urban Fringe Area before and after the Construction of the Fringe-Settlements

Past Data (1990)	Existing Data (2010)
Land use is dominated by moor & paddy fields	Optimized land use on the incidence of various activities as a result of new residential functions.
Residential areas still form in the lush countryside	Residential areas dominated by multifunctional home or home-business
Condition of neighborhood streets still a dirt road & gravel road	Condition neighborhood road of asphalt road and paving-block

Land use changes in the rural-urban fringe area also due to changes in building functions of the respondents. They accidentally change the function of their buildings became home-business and it is influenced by the existence of fringe-settlements. More details can be seen in Table 5.7.

72.9 per cent of land use is paddy field in 1990, turned out in 2010 as much as 98.32 per cent of the function of the building into home-business. Then, 23.2 per cent of land use is moor in 1990. It changes to be home-business of 97.5 per cent. This occurred because it is influenced by the existence of the fringe-settlements.

**Table 5.7** Type of land use before 1990\* Function of the building in 2010\* Relationship with the construction of the fringe-settlements Cross-Tabulation

Relationship with the construction of fringe-settlements		Function of the building in 2010			Total
		Residential/home only	Home-business	Shops	
Yes	Paddy field	1	117	1	119
	Moor	1	39		40
	Other	2			2
No	Total	4	156	1	161
	Type of land use before 1990				
	Paddy field	29			29
	Moor	7			7
Did not know	Other	1	2		3
	Total	37	2		39
	Other		2		2
	Total		2		2
Chi-Square	<b>80.162</b>			DF	4

## 5.7 Building changes

### Changes in the building area

In conducting research on building area, then that becomes the basis for the set increases, fixed or reduced building is, whether or not change to the building of origin. The analysis in this study aims to determine the relationship between the building area before and after the construction of the 'fringe-settlements' in the rural-urban fringe areas.

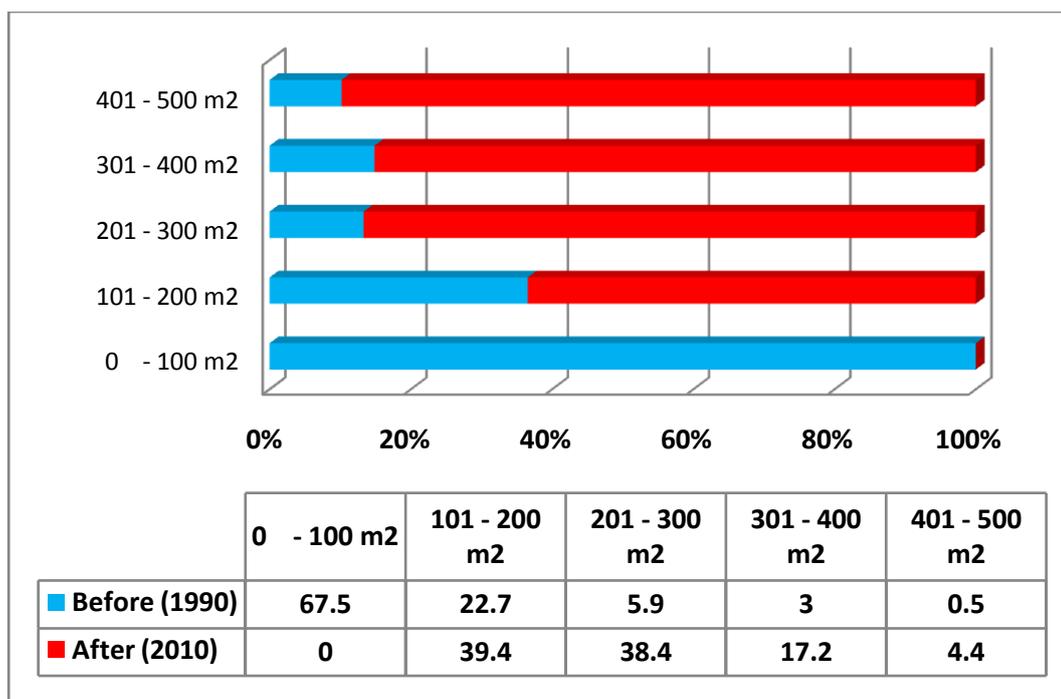
**Table 5.8** Building Area Occupied before and after the Construction of the Fringe-Settlements in the Rural-Urban Fringe Areas

Building Area (m <sup>2</sup> )	Fringe-Settlements			
	Before		After	
	f	%	f	%
0 - 100 m <sup>2</sup>	137	67.5	0	0
101 - 200 m <sup>2</sup>	46	22.7	80	39.4
201 - 300 m <sup>2</sup>	12	5.9	78	38.4
301 - 400 m <sup>2</sup>	6	3.0	35	17.2
401 - 500 m <sup>2</sup>	1	0.5	9	4.4
> 501m <sup>2</sup>	0	0	0	0
Total	202	100	202	100
<b>Chi-Square</b>			110.275	
DF	12			

The relationship or the linkage analysis based on the assumption that the building area in 2010 (after the construction of the 'fringe settlements') increases or changes instead of building area in 1990 (before the construction of the fringe-settlements). To support or test this assumption is necessary calculations through cross tabulation. The calculation using the cross tabulation show that the building area before the construction of the fringe-settlements has a relationship to the building area after the construction of the fringe-settlements.

This is proved by value for Chi-Square (Count) with the each degree of freedom (degree of freedom = 12) is greater than Standard Chi-Square (Table), namely: Chi-Square (Count) = 110.275 more than Chi-Square (table) = 21.03, at 95 per cent confidence level (level of significance 0.05).

Table 5.8 and Figure 5.9 shows that the majority of building area in 1990 (before the construction of the 'fringe-settlements') is 0 m<sup>2</sup> to 100 m<sup>2</sup> of 67.5 per cent but in 2010 (after the construction of the 'fringe-settlements') had the addition, which is more in the 101 m<sup>2</sup> to 200 m<sup>2</sup> of 39.4 per cent, which was originally only for 22.7 per cent in 1990.



**Figure 5.9** Percentage of 'building area' in 1990 and 2010

It could be argued that the building area which was originally 67.5 per cent in 1990 (0 m<sup>2</sup> to 100 m<sup>2</sup>), decreased to 0 per cent in 2010. This is due to building area which was originally only 0 m<sup>2</sup> to 100 m<sup>2</sup> has to be started from the addition of 101 m<sup>2</sup> to 200 m<sup>2</sup> changes to more than 501 m<sup>2</sup>.

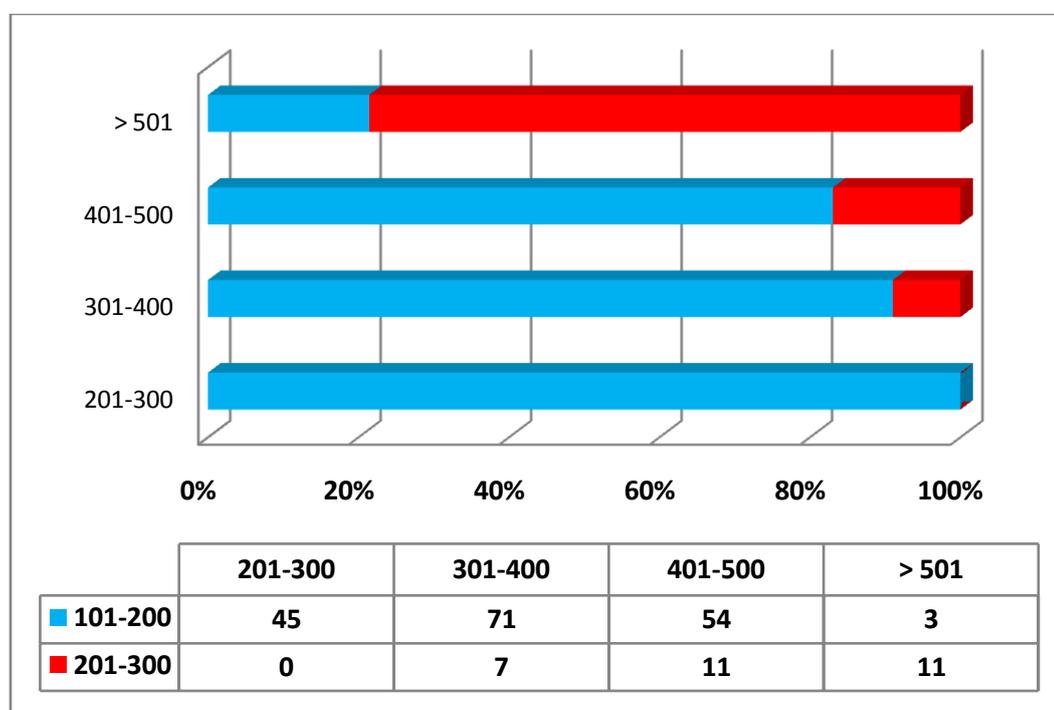
Factors that cause them to make changes to the wide building are due to the existence of 'fringe-settlements'. The number of immigrants living in the fringe-settlements leads the people in the rural-urban fringe areas increase the area of the building to be a place of business in order to meet the needs of the newcomers. They are willing to occupy only a fraction of their whole house.

Based on the cross tabulation between total building area of respondents with a building area which is used as a place of business known that out of 45 persons who have large houses totaling 201 m<sup>2</sup> to 300 m<sup>2</sup>, all of them occupied the home-business with the size of 101 m<sup>2</sup> to 200 m<sup>2</sup>, whereas of the 78 persons who have whole wide house 301-400 m<sup>2</sup>, a total of 71 persons who occupy a home-business the size of 101 m<sup>2</sup> to 200 m<sup>2</sup>, while the 7 persons occupied the home-business with the size of 201 m<sup>2</sup> to 300 m<sup>2</sup>.

Table 5.9 shows that the People in the rural-urban fringe change the size of their building because of business. It shows that in 1990 of 67.5 per cent of size of the building is 0 m<sup>2</sup> to 100 m<sup>2</sup>. In 2010, as much as 56.32 per cent of size of the building changes into 101 m<sup>2</sup> to 200 m<sup>2</sup>, and as much as 34.48 per cent of size of the building turns into 201-300 m<sup>2</sup>. Meanwhile, 22.7 per cent of size of the building is 101 m<sup>2</sup> to 200 m<sup>2</sup> in 1990, a total of 62.86 per cent of size of the building changes into 201 m<sup>2</sup> to 300 m<sup>2</sup>. So, 87.26 per cent of size of the building changed because the respondents make repairs or renovations on their house for business.

**Table 5.9** Size of building in 1990\*Size of building in 2010\*Cause of changes/addition of building

Cause of changes/additions of the building	Size of building in 1990 (m <sup>2</sup> )	Size of building in 2010 (m <sup>2</sup> )				Total
		101-200	201-300	301-400	401-500	
New family members	0-100	3	1		1	5
	401-500				1	1
Business		3	1		2	6
	0-100	49	30	8		87
	101-200	2	22	7	4	35
	201-300		3	6		9
	301-400			4	2	6
Other		51	55	25	6	137
	0-100	9	1	1		11
	101-200		1	2		3
None		9	2	3		14
	0-100	16	15	3		34
	101-200	1	5	2		8
	201-300			2	1	3
Chi-square		17	20	7	1	45
		<b>74.044</b>			DF	9



**Figure 5.10** Relationship between the total building areas of respondents with a building area which is used as a place of business

Figure 5.10 show that the homeowner will make adjustments to his house with the development of their business activities. One way is to add a building area of their home-businesses. Of course, it affects the overall building area of the respondent owned.

### **Changes in the function of buildings**

In conducting research on the function of buildings, so that becomes the basis for setting change, whether or not the function of the building is, whether or not a change to the function of the building in 1990 and 2010. The purpose of this analysis conducted to determine the relationship between the functions of building in 1990 and building functions in 2010.

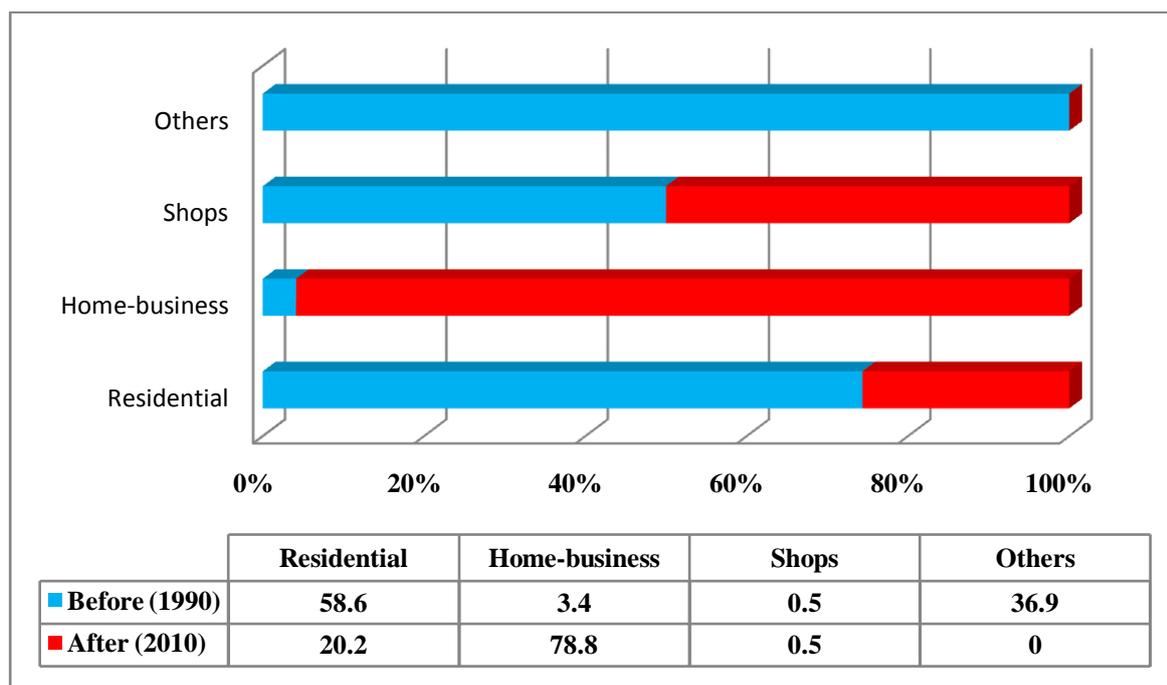
The relationship or linkage analysis is based on the assumption that the function of the building in 2010 (after the 'fringe-settlements') changed compared to the function of the building in 1990 (before the 'fringe-settlements'). To support of this assumption is necessary calculation through cross tabulation.

**Table 5.10** Functions of the Building in the opinion of the respondents

Function of building	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
Residential	119	58.6	41	20.2
Home-business	7	3.4	160	78.8
Shops	1	0.5	1	0.5
Eating stalls	0	0	0	0
Daily stalls	0	0	0	0
Office	0	0	0	0
Laundry	0	0	0	0
Salon	0	0	0	0
Internet cafes	0	0	0	0
Others	75	36.9	0	0
Total	202	100	202	100
<b>Chi-Square</b>			237.668	
<b>DF</b>	6			

Table 5.10 and Figure 5.11 show that the function of building in 1990 (before the construction of the 'fringe settlements') serves more as a residential as many as 119 residences or 58.6 per cent and 36.9 per cent of the function of building is others. It means that residential and garden or residential and paddy field/moor). In 2010 (after the construction of the 'fringe-settlements') changes, i.e. more serves as a 'home business' of 160 'home business' or 78.8 per cent, which was originally in 1990 only amounted to 3.4 per cent. This caused the number of migrants (residents of the 'fringe-settlements') who stay in the area. So as to meet their needs, 'the population origin' in the 'rural-urban fringe area' changes in function of the building become commercially.

From the cross tabulation table known, that from a total of 58.6 per cent in 1990 function of the building is a 'residential/home only', in 2010 as many as 20.2 per cent functions of their building remains as a residence. In contrast, as many as 78.8 per cent experience changes function of the building from residential become the home of business.



**Figure 5.11** Percentage of function of the buildings before and after the construction of the 'fringe settlements' in rural-urban fringe area

Table 5.11 describes that the function of building in 1990 and the function of building in 2010 changed. It has relationship with the construction of the 'fringe-settlements'. This is proved by the Chi-Square (Count) with each degree of freedom (DF=6) larger than the Standard Chi-Square (Table), namely Chi-Square (Count) = 164.927 more than Chi-Square (Table) = 12.59, at 95 per cent confidence level (level of significance 0.05).

**Table 5.11** The function of building in 1990\*the function of building in 2010\*Relationship with the construction of the 'fringe-settlements'

Relationship with the construction of the 'fringe-settlements'		The function of the building in 2010			Total	
		Residential/ home only	Home- business	Shops		
Yes	Residential	4	78		82	
	Home-business		7		7	
	Shops			1	1	
	Other		71		71	
The function of building in 1990	Residential	4	156	1	161	
	Other	37			37	
No	Residential	37			37	
	Other		2		2	
Did not know	Residential	37	2		39	
	Other		2		2	
			2		2	
Chi-square		<b>164.927</b>			DF	6

\*Other is residential and paddy field/moor

One of the factors that cause the people in the rural-urban fringe area make changes function of the building and they think more commercially because of the existence of 'fringe-settlements' with a lot of inhabitants. In order to meet needs of the residents 'fringe-settlements', they make changes function of building from residential to 'home-business'. It is

closely related to the possibility of additional income they get. Previously they would have to spend money to change the function of the building of their homes. The amount of money they spend can be seen in the following table:

**Table 5.12** The total initial investment of home-business owners

No.	The total initial investment (Rupiah)	Total	%
1	1 million to 5 million	103	50.7
2	more than 5 million to 10 million	57	28.1
3	more than 10 million to 20 million	29	14.3
4	More than 20 million	13	6.4
	Total	202	100

1USD = 9800 Rupiah

Based on the fact in the study area, it shows that 50.7 per cent of the home-owners started their business with a fairly small investment of 1 million into 5 million (Rupiah). This situation is possible because most of them start their business do not make a home for businesses but by utilizing the existing house, only a small part that started his business by making a new home.

Total of initial investment issued by the owner's of home-business are used to make adjustments either in the form of improvements or additions to the inside of his house, and increase the area of their home by creating new buildings.

Repairs and adjustments are made by homeowners such as the manufacture of doors and windows, painting, making bathrooms and toilets, insulation of the room there is to be 'business premises' and others. While, definition of the making a new building is to increase the area of existing homes. Thus, to start a business, the homeowner does not cost too much.

One of the reasons of the people in the rural-urban fringe areas change the function of the building is because they expect greater earnings than the results of their home-business. Meanwhile, the total income they earn from the 'home-business' as long as this as follows:

**Table 5.13** Respondent's income per month

No.	Income per month (Rupiah)	Total	%
1	less than 750 thousand	68	33.5
2	750 thousand to 1.5 million	51	25.1
3	1.5 million to 2 million	40	19.7
4	2 million to 2.5 million	22	10.8
5	More than 2.5 million	7	3.4
6	None	14	6.9
	Total	202	100

1USD = 9800 Rupiah

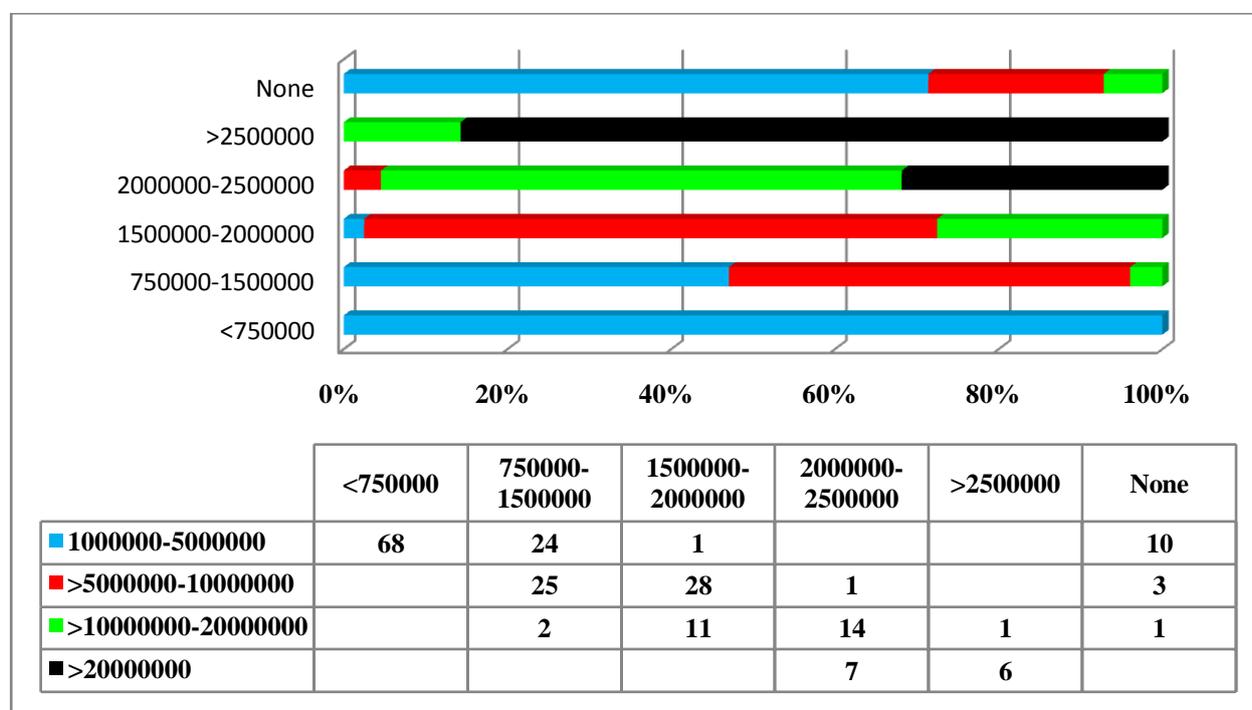
The income from home-business owner is found to be 33.5 per cent per month or as many as 68 home-business owners have a gross income of 750 thousand (Rupiah) per month. Furthermore, 25.1 per cent for home-business owners or as many as 51 home-business owners have a gross income of 750 thousand to 1 million (Rupiah) per month. Then 19.7 per cent or as many as 40 home-business owners have a gross income of 1.5 million up to 2 million, 10.8 per cent or some 22 home-business owners have a gross income of 2 million to 2.5 million. Furthermore, 3.4 per cent or as many as 7 home-business owners have an income

more than 2.5 million (Rupiah) per month. Income homeowners are depending on the type of business that they have created. For homeowners who have a business that much in demand/needed by residents 'fringe-settlements', then the monthly income will be greater than having a different business. Thus, more and more businesses are in demand the greater the income earned each month.

**Table 5.14** The total initial investment of home-business owners \* Respondent's income per month  
Cross-Tabulation

		Respondent's income per month (Rupiah)						Total
		Less than. 750 thousand	750 thousand to 1.5 million	1.5 million to 2 million	2 million to 2.5 million	More than 2.5 million	None	
The total initial investment of home-business owners (Rupiah)	1 million to 5 million	68	24	1			10	103
	more than 5 million to 10 million		25	28	1		3	57
	more than 10 million to 20 million		2	11	14	1	1	29
	more than 20 million				7	6		13
Total		68	51	40	22	7	14	202

1USD = 9800 Rupiah



**Figure 5.12** Relationship between the total initial investment of home-business owners and respondent's income per month

Furthermore, to determine whether the amount of income they get per month is related to the amount of capital they have to spend to change the function of the house, can be seen in the cross tabulation between the size of the investment they make with how much income they earn on the following cross tabulation tables.

Table 5.14 shows that the monthly income of the home-business owners has relationship to the large of initial investment issued by the home-business owners. This is evidenced by the Chi-Square (Count) with each degree of freedom (DF = 15) larger than the Standard Chi-Square (Table), namely, Chi-Square (Count) = 282.581 more than Chi-Square (Table) = 25.00, at 95 per cent confidence level (level of significance 0.05). Thus, it can be concluded that the size of the income received by the home-business owners had everything to do with the large initial investment issued by the home-business owners.

**Table 5.15** Main income per month\*Second income per month\*Kinds of the main job

Kinds of the main job	Main income per month (Rupiah)	Second income per month (Rupiah)						Total
		Less than 750th	750th-1.5m	1.5m-2m	2m-2.5m	More than 2.5m	None	
Farmer	Less than 750th	1	2					3
	750th-1.5m	5	1	2		1		9
	1.5m-2m	6	3	2		1	2	14
Merchant	Less than 750th	2	2	1				5
	750th-1.5m	5	4	2	4	1	2	18
	1.5m-2m	7	6	3	4	1	5	28
Public servant	750th-1.5m					1		1
	2m-2.5m	35	26	25	11	3	3	103
	More than 2.5m				1			1
Army/Police	Less than 750th	35	26	25	12	4	3	105
	750th-1.5m	1	4	2				7
	1.5m-2m	1	1	2	1			5
Retired	750th-1.5m	2	5	4	1			12
	1.5m-2m	3	2	5	2	1		13
	More than 2.5m	3	2	5	3	1		14
Entrepreneur	More than 2.5m	11	5		1			17
	Less than 750th	11	5		1			17
Other	750th-1.5m		4					4
	More than 2.5m	4			1		2	7
	Less than 750th			1				1
		4	4	1	1		2	12
<b>Chi-Square</b>		<b>33.301</b>					<b>DF</b>	<b>10</b>

\* 1 USD = 9800 Rupiah; th=thousand; m=million

Table 5.15 shows that the majority of respondent's main job is a public servant of 51.7 per cent with the main income between 2 million to 2.5 million per month. Thus, changes in function of their homes as a place of business just as second job in order to fill spare time by utilizing the functions of their building. Where, the income they earn is not much of a main goal.



**Figure 5.13** Home-business of respondent's in rural-urban fringe area (\*the function of this building is home-restaurant, close to the fringe-settlements Purwantoro Agung)

The cross tabulation table between initial investment and income also showed that the larger of the investment is issued. There is the possibility of earned income will be even greater. However, the income is still influenced by several things, namely: the rents set by the home-business owners, home type, year of the house, and home distance to the 'fringe-settlements'.

### **Changes in shape of buildings**

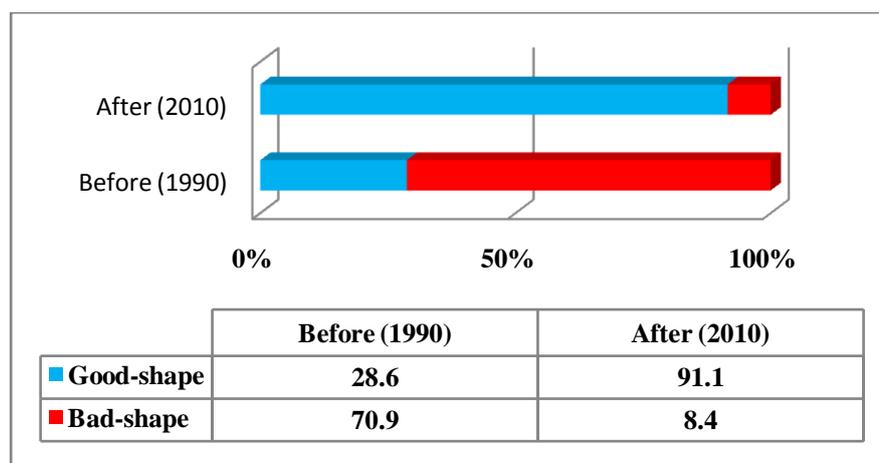
The results of field surveys indicate that shape of the building belonged to the respondent is good-shape around 67.46 per cent in 1990. While, remaining 32.54 per cent of the building is not good-shape. In 2010, there were 93.49 per cent shape of the building belonged to the respondent is good-shape. This means an increase of 26.03 per cent.

Table 5.16 and Figure 5.14 show that there changes in shape of the building belonged to the respondent. In 1990, as much as 28.6 per cent shape of the building the respondent's good-shape, in 2002 increased to 91.1 per cent of the form of the building is good-shape. The result of interviews with some respondents in the field is known that change in shape of the building is indeed related to the existence of 'fringe-settlements'. In an effort to meet needs of migrants living in the fringe-settlements, the local community responded by providing all the needs of migrants from food stalls, photocopy, internet cafes, mini market, and others. This causes the function of the respondent's house became the home-business. It provides benefits for home-business owners because they get extra income that is even more likely than their principal income. This led to increased revenue they build their houses becoming better with

the shape of the building more modern, more robust construction, better meet the health requirements.

**Table 5.16** Shape of the building in the opinion of the respondents

Function of building	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
Good-shape	58	28.6	185	91.1
Not good-shape	144	70.9	17	8.4
Total	202	100	202	100
<b>Chi-Square</b>			4.727	
<b>DF</b>	1			



**Figure 5.14** Percentage of the condition of shape of the building before and after the construction of the 'fringe settlements' in rural-urban fringe area

**Table 5.17** Condition of shape of the building in 1990\*Condition of shape of the building in 2010  
Cross-Tabulation

		Condition of shape of the building in 2010		Total
		Good-shape	Bad-shape/is not good-shape	
Condition of shape of the building in 1990	Good-shape	57	1	58
	Bad-shape/ not good shape	128	16	144
Total		185	17	202

From the result of cross tabulation (Table 5.17) shows that in 1990 of 70.9 per cent of shape of the building is not good-shape. In 2010, as much as 11.11 per cent of shape of the building is still not good-shape, and as much as 88.89% of shape of the building turns into good-shape. Meanwhile, 28.6 per cent of shape of building is good-shape in 1990, a total of 98.28 per cent of shape of the building remains good-shape. The remaining 1.72 per cent of shape of the building turns into bad-shape. This is because the respondents did not make repairs/renovations on their house because of several considerations related to finance.

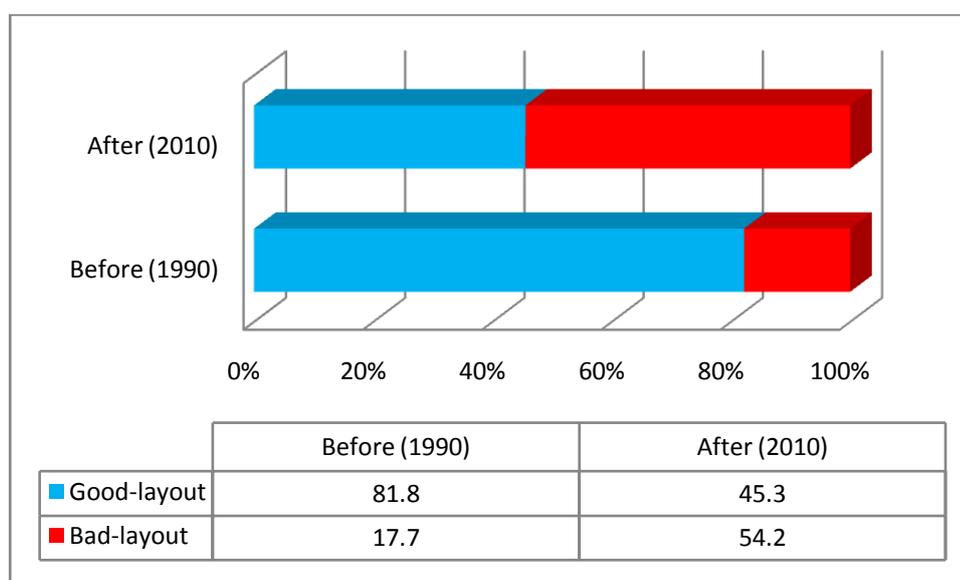
### Changes in the layout of buildings

The results of field survey show that the existence of 'fringe-settlements' has changed the rural-urban fringe areas. Thus, it affects the layout of the building lots are increasingly disorganized and have difficulty in regulating the utility environment. Irregularity is due to the increasing home-business to meet needs of immigrants living in the 'fringe-settlements'. The building is becoming increasingly crowded and have additional vertical (stratified).

**Table 5.18** Layout of the building in the opinion of the respondents

Layout of the building	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
Good-layout	166	81.8	92	45.3
Not good-layout	36	17.7	110	54.5
Total	202	100	201	100
<b>Chi-Square</b>	36.639			
<b>DF</b>	1			

Table 5.18 shows that as much as 81.88 per cent layout of the buildings is good-layout, and as much as 17.7 per cent of layout of the buildings is not good-layout in 1990. In 2010, layout of the buildings is not good-layout increased by 36.8 per cent i.e. 54.5 per cent as much as layout of the building to be not good-layout.



**Figure 5.15** Percentage of layout of the building before and after the construction of the 'fringe-settlements' in rural-urban fringe

Calculation of cross tabulation shows that, the condition of layout of the buildings in 1990 (before the construction of the 'fringe-settlements') has a relationship to the condition of layout of the buildings in 2010 (after the construction of the 'fringe-settlements'). This is evidenced by the Chi-Square (Count) with each degree of freedom (DF = 1) larger than the Standard Chi-Square (Table), namely, Chi-Square (Count) = 36.639 more than Chi-Square (Table) = 3.84, at 95 per cent confidence level (level of significance 0.05).

17.7 per cent condition of layout of the building is not good-layout in 1990. In 2010, as many as 54.5 per cent condition of layout of the building is still not good-layout. While, 81.8 per cent of condition of the building layout is good-layout in 1990, turned out in 2010 as much as 44.57 per cent condition of the building layout turns into bad-layout and the condition of the building layout remains good-layout as much as 55.42 per cent. This is because the public building owners to do the addition on the building not only horizontally but also vertically much more. This causes the environmental conditions to be seen more crowded and more disorganized (Table 5.19).

**Table 5.19** Changes/addition of the building in 2010\*Cause/reason of changes/additions of the building\*Layout of the building in 2010

Layout of the building in 2010		Cause/reason of changes/additions of the buildings				Total
		New family members	Business	Other	None	
Good-layout	Yes	1	54	7		62
	No				30	30
Bad-layout	Yes	1	54	7	30	92
	No	5	83	7		95
Changes/additions of the building in 2010		5	83	7	15	110
Chi-square	<b>92.00</b>			DF	3	

## 5.8 Infrastructure of rural-urban fringe

In conducting of the research on the condition of the neighborhood road which is the basis for setting criteria of 'good', 'medium', and 'bad' is based on road construction, width/function of neighborhood road that exist.

- Condition of neighborhood road is categorized '**good**' if it meets the following criteria: The construction consists of concrete/asphalt and is equipped with a channel/trench-waster, then its function as the infrastructure of the mobility of goods and services, due to the width that can reasonably be passed up by the vehicle wheel 4.
- Condition of neighborhood road is categorized '**medium**' if it meets the following criteria: The construction of neighborhood road only in the form hardening, without asphalt and tract/ditch-wasters, and can only be passed by a maximum of two-wheeled vehicles.
- Condition of neighborhood road is categorized '**bad**' if it meets the following criteria: Neighborhood road that is still in the form of the path/dirt road without hardening and wasters tract, and can only be traversed a maximum of bicycles and pedestrians.

The purpose of this analysis conducted to determine the relationship/linkages between the condition of neighborhood road in 1990 and the condition of neighborhood in 2010. This study analyzed the relationship/linkages based on the assumption the condition of the neighborhood road in 2010 (after the construction of the 'fringe-settlements') changed for the better than the condition of the neighborhood road in 1990 (before the construction of the 'fringe-settlements'). To support or test this assumption is necessary the calculation by cross tabulation.

**Table 5.20** Condition of neighborhood road in the opinion of the respondents

Condition of neighborhood road	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
Good	18	8.9	137	67.5
Medium	164	80.8	65	32.0
Bad	20	9.9	0	0
Total	202	100	202	100
<b>Chi-Square</b>			25.559	
DF	2			

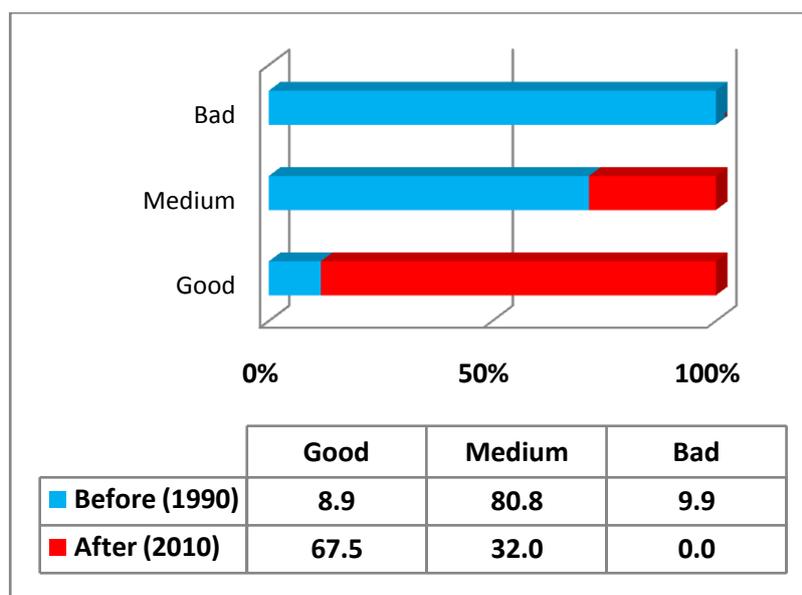
**Figure 5.15** Percentage of the condition of the neighborhood road in 1990 and in 2010

Table 5.20 and Figure 5.16 show that the condition of neighborhood road in 1990 more in the medium condition that is equal to 80.8 per cent (before the construction of the 'fringe-settlements') and 9.9 per cent of neighborhood road in the bad condition. Then, only 8.9 per cent of neighborhood road is good-condition. In contrast, the condition changed in 2010 (after the construction of the 'fringe-settlements') that is more in the good condition (67.5 per cent), and no more neighborhood road in the bad condition (0.00 per cent). This proves the existence of 'fringe-settlements' leads to changes in conditions of neighborhood road getting better.

The calculation of cross tabulation shows that condition of neighborhood road in 1990 (before the construction of the 'fringe-settlements') has a relationship to the condition of neighborhood road in 2010 (after the construction of the 'fringe-settlements'). This condition evidenced by the Chi-Square (Count) with each degree of freedom (DF = 2) is greater than Standard Chi-Square (Table), namely, Chi-Square (Count) = 25.559 more than Chi-Square (Table) = 5.99, at 95 per cent confidence level (level of significance 0.05). From 9.9 per cent of the bad condition of the neighborhood road in 1990, a total of 75 per cent the condition is changed to the medium condition in 2010, and as much as 25 per cent the condition of neighborhood road turned into the good condition. Meanwhile, from 80.8 per cent condition of neighborhood road is the medium condition in 1990, a total of 69.51 per cent turned into

the good condition in 2010, and the remaining 30.49 per cent the condition of neighborhood road remains a medium condition in 2010.

Based on the field survey, some respondents said that before the construction of the 'fringe-settlements', the good-condition of neighborhood road is little. This can be understood, because of the fact that exists in the field, the condition of neighborhood road that used to be a path/soil will be flooded and muddy in the rainy season because it has not been paved and it has not equipped with tract wasters/drainage. In contrast, in the dry season the dust would fly. This condition has changed so much after the construction of the 'fringe-settlements', most of the neighborhood road paved and equipped with 'tract wasters'. Accessibility of people and goods to be smooth, flooding is reduced. So when it compared with the condition of neighborhood road before the construction of the 'fringe-settlements', then the condition is much better now.

The secondary data shows that there is a change in conditions of neighborhood road. Which was originally just a gravel road or pavement in 1990, it turned into asphalt road in 2010.



**Figure 5.17** Condition of the neighborhood road in rural-urban fringe area close to the fringe-settlements 2010

## 5.9 Utilities and home environment of rural-urban fringe

### Source of water

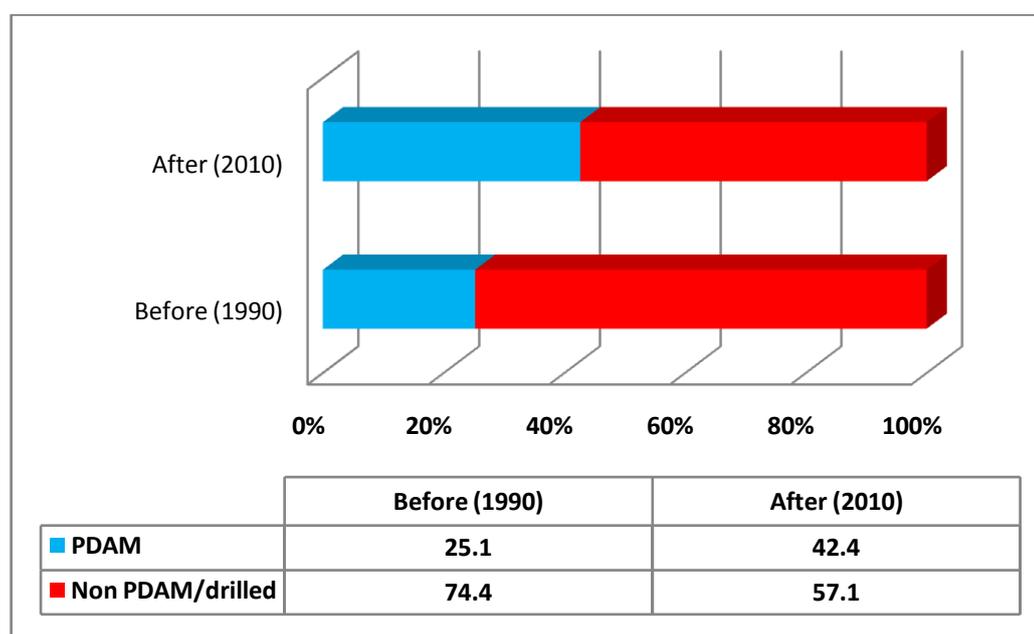
The results of field surveys indicate that as many as 51 persons or 25.1 per cent of respondents in the 1990 subscription PDAM for clean water sources are used every day, and as many as 151 persons or 74.4 per cent of respondents non PDAM but there are from the river and from wells drilled homemade. In 2010, the use of PDAM increased by 17.3 per cent i.e. from the originally as much as 25.1 per cent to 42.4 per cent. Meanwhile, the use of wells/non PDAM has decreased but still more numerous than those using the PDAM, which decreased by 17.31 per cent, which was originally as much as 74.4 per cent to 57.1 per cent only. For more details, it can be seen in Table 5.21 and Figure 5.18.

The calculation of cross tabulation shows that the source of water in 1990 (before the construction of the 'fringe-settlements') has a relationship to the source of clean water in 2010 (after the construction of the 'fringe-settlements'). This condition evidenced by the Chi-Square (Count) with each degree of freedom (DF = 1) is greater than Standard Chi-Square

(Table), namely, Chi-Square (Count) = 92.025 more than Chi-Square (Table) = 3.84, at 95 per cent confidence level (level of significance 0.05).

**Table 5.21** Source of water in the opinion of the respondents

Source of clean water	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
PDAM	51	25.1	86	42.4
Non-PDAM/Drilled	151	74.4	116	57.1
Total	202	100	202	100
<b>Chi-Square</b>			92.025	
<b>DF</b>	1			



**Figure 5.18** Percentage of the source of water in 1990 and 2010

In 1990, 51 persons or 25.1 per cent of respondents who use the PDAM, in 2010 they still use PDAM. Meanwhile, in 1990 from 151 persons or 74.4 per cent of respondents who do not use PDAM or use wells/non PDAM, as many as 116 persons or 76.82 per cent still use wells or non-PDAM as a source of water, the remaining 35 persons or 23.18 per cent changed to the PDAM as a source of water (Table 5.22).

**Table 5.22** Source of water in 1990\* Source of water in 2010 Cross-Tabulation

Source of water in 1990	Source of water in 2010		Total
	PDAM	Non-PDAM/drilled	
PDAM	51		51
Non PDAM/drilled	35	116	151
Total	86	116	202
Chi-square	<b>92.025</b>	DF	1

\*PDAM=Regional Water Supply Company

The results of interviews indicated that more respondents did not use the services of PDAM for the water sources daily due to the incomplete services provided to customer's PDAM not

only in terms of services but also the water quality is a less well. Frequent occurrence of bottlenecks flow at certain hours, which causes the local community/respondents prefer not to use PDAM.

Increasing the number of users/customers from PDAM is related to changes in building functions of the respondents in 2010. The owners of home-business choose to keep using the drilled because they consider that the quality of PDAM is still not ensuring their home-business. Table 5.23 shows that 74.4 per cent of water source is drilled in 1990, still use drilled in 2010 as much as 74.4 per cent of the function of the building into home-business. Then, 25.1 per cent of water source is PDAM in 1990 changes to be drilled of 0.06 per cent. It means that all of the owners of the home-business prefer choose drilled for their water source related to their home-business.

**Table 5.23** Source of water in 1990\* Source of water in 2010\* Function of the building in 2010  
Cross-Tabulation

Function of the building in 2010		Source of water in 2010		Total
		PDAM	Non-PDAM/drilled	
Residential/home only	PDAM	16		16
	Non PDAM/drilled	3	22	25
		19	22	41
Home-business	Source of water in 1990			
	PDAM	33	2	35
	Non PDAM/drilled	32	93	125
		65	95	160
Shops	Non PDAM/drilled		1	1
			1	1
Chi-square	<b>30.383</b>		DF	1

### **Waste services system**

In conducting to the research on waste services, the basis for the establish criteria for good-condition, medium-condition, bad-condition is based on the timeliness of transport officers, and the availability of facilities waster.

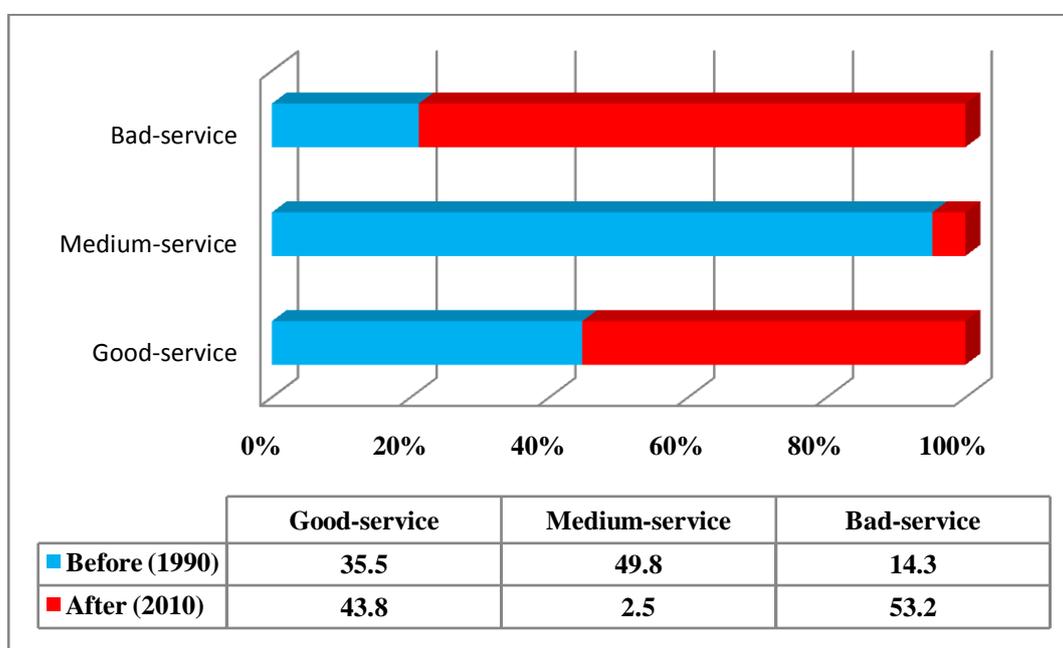
- Waste services categorized as '**good**' when the time transport of cleaning staff of the city and the environment sanitation officer is on schedule, so the waste does not accumulate. Waste facilities and infrastructure (tanks and the wheelie bin) are sufficient or completed.
- Waste services categorized as '**medium**' when the ability and carrying capacity of the environment sanitation officers not on-time. Although, it supported facilities are sufficient.
- Waste services categorized as '**bad**' when carrying capacity of the cleaning staff environment not on-time, and not supported facilities/infrastructure are adequate.

The purpose of this analysis conducted to determine the relationship between waste services in 1990 and waste service in 2010. Analysis of the relationship/linkage is based on the assumption that the waste service in 2010 (after the construction of the 'fringe-settlements')

changed for worse than waste services in 1990 (before the construction of the 'fringe settlements'). To support this assumption is necessary calculations through cross tabulation. Table 5.24 and Figure 5.19 shows that the waste service in 1990 (before the construction of the 'fringe settlements') is good-services of 35.5 per cent, and 49.8 per cent is 'medium' of services, while only 14.3 per cent of poor/bad-services. This fact illustrates that the waste disposal facility in 1990 was still not sufficient because it collided with the condition of residential areas are rare. So besides hard to put the trash cans, transport access is also difficulties. As a result, people tend to take a shortcut by taking out the trash at any place. In 2010, bad-waste service increased to 53.2 per cent from 14.3 per cent. Waste service system in 2010 has shown improvement, but there are still some things to get further improvement. Particularly with respect to the ability of haulage cleaning staff city to no longer burden the officers in the neighborhoods because based on reality, things are those which cause was the presence of respondents who declared the service waste system is not maximized.

**Table 5.24** Condition of Waste service in the opinion of the respondents

Condition of waste services	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
Good	72	35.5	89	43.8
Medium	101	49.8	5	2.5
Bad	29	14.3	108	53.5
Total	202	100	202	100
<b>Chi-Square</b>			146.33	
			0	
DF	4			



**Figure 5.19** Percentage of the condition of waste service in 1990 and 2010

The calculation of cross tabulation shows that the service waste system in 1990 (before the construction of the 'fringe-settlements') has a relationship to the service waste system in 2010 (after the construction of the 'fringe-settlements'). This condition evidenced by the Chi-

Square (Count) with each degree of freedom (DF = 4) is greater than Standard Chi-Square (Table), namely, Chi-Square (Count) = 146.330 more than Chi-Square (Table) = 9.49, at 95 per cent confidence level (level of significance 0.05).

The results of cross tabulation showed that 14.3 per cent of waste services condition is bad-services in 1990. A total of 3.44 per cent waste services into good-services in 2010, 96.55 per cent of its waste services remain bad-services.

Table 5.25 shows that waste service which dropped the service, 49.8 per cent condition of waste services is moderate-services in 1990. A total of 79.21 per cent condition of waste services turns into bad-services in 2010.

**Table 5.25** Condition of waste services in 1990\* Condition of waste services in 2010  
Cross-Tabulation

		Condition of waste services in 2010			Total
		Good- services	Medium- services	Bad- services/ not good- services	
Condition of waste services in 1990	Good-services	72			72
	Medium- services	16	5	80	101
	Bad-services	1		28	29
Total		89	5	108	202

It is due to systematic waste services have not been going well especially the inadequate number of officers, and the waste hauler has not been precisely the time of transport. Meanwhile, the amount of waste increases progressively with increasing resident and the layout of the building is not-good. This affects the waste service into a bad system (Table 5.26)

**Table 5.26** Condition of waste services in 1990\*Condition of waste services in 2010\*Layout of the  
building in 2010

Layout of the building in 2010			Condition of waste service in 2010			Total
			Good	Medium	Bad	
Good	Condition of waste service in 1990	Good	71			71
		Medium	16	5		21
Not-good	1990	Good	87	5		92
		Medium	1		80	81
		Bad	1		28	29
Chi-square			2		108	110
		<b>17.876</b>			DF	1

### Environmental of health

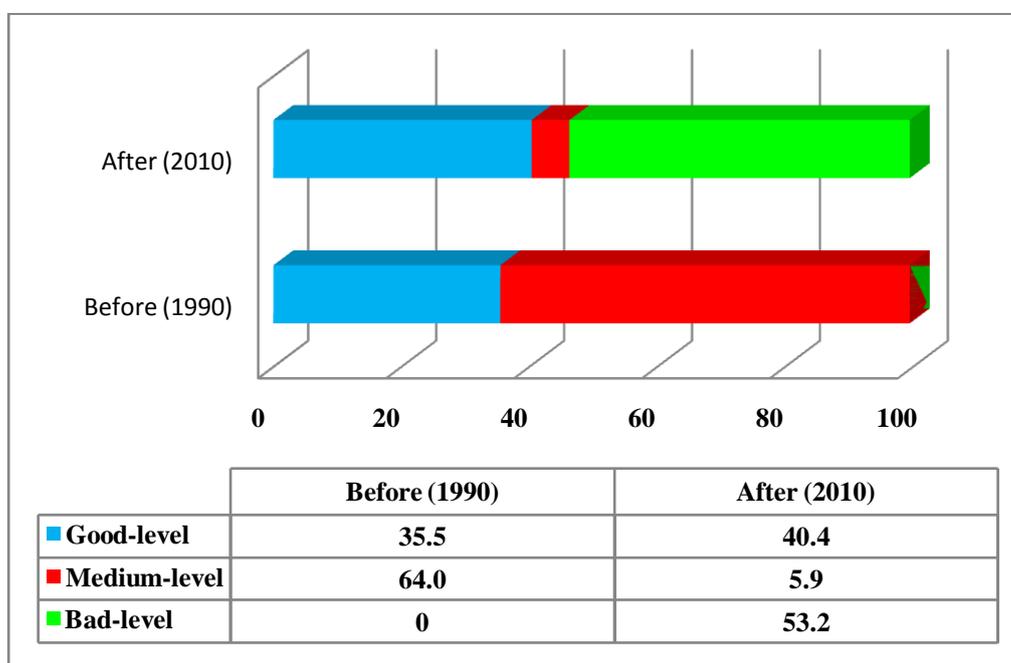
In conducting research on environmental health that became the basis for establishing criteria for the high-level, medium-level, and bad-level is as follows:

- Environmental of health categorized as **'high-level'** when the environment was clean. It means, clean of garbage that scattered, 'MCK activity' is available per house, sources of clean water are generally sourced at PDAM, and the sewers are not blocked or flooded.
- Environmental health categorized as **'medium-level'** if the environmental hygiene has been well managed, but there are still some people who use the river as a place of MCK activity and sources of clean water, the sewers are not optimal.

The purpose of this analysis conducted to determine the relationship between environmental health environmental health in 1990 and 2010. Analysis of the relationship/linkage is based on the assumption that environmental health in 2010 (after the construction of the 'fringe-settlements') changed for the better health than the environment in 1990 (before the construction of the 'fringe-settlements'). To support this assumption is necessary calculation through cross tabulation.

**Table 5.27** Level of environmental health in the opinion of the respondents

Level of environmental health	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
Good	72	35.5	82	40.4
Medium	130	64.0	12	5.9
Bad	0	0	108	53.2
Total	202	100	202	100
<b>Chi-Square</b>			144.504	
<b>DF</b>	2			



**Figure 5.20** Percentage of the level of environmental health in 1990 and 2010

Table 5.27 and Figure 5.20 show that the health of the environment in the study area in 1990 is 64 per cent 'medium-health'. In 2010, this condition changed for the worst 53.2 per cent.

The calculation of cross tabulation shows that the level of environmental health in 1990 (before the construction of the 'fringe-settlements') has a relationship to the level of environmental health in 2010 (after the construction of the 'fringe-settlements'). This condition evidenced by the Chi-Square (Count) with each degree of freedom (DF = 2) is greater than Standard Chi-Square (Table), namely, Chi-Square (Count) = 144.504 more than Chi-Square (Table) = 5.99 at 95 per cent confidence level (level of significance 0.05).

64 per cent of the total condition of environmental health is 'medium-level' in 1990. As much as 10 per cent condition is changed to 'high-level' (good) in 2010, but the cross tabulation shows that environmental health has decreased. 64 per cent environmental health is a medium-level in 1990, as much as 83 per cent the condition becomes bad-level in 2010. This is because the density of buildings, occupants, and unfavorable waste services in 2010 (Table 5.28).

**Table 5.28** Level of environmental health in 2010\*Condition of waste service in 2010\*Source of water in 2010

Source of water in 2010			Condition of waste service in 2010			Total
			Good	Medium	Bad	
PDAM	Good		32	4		36
	Bad				48	48
	Level of environmental health in 2010	Good	32	4	48	84
Non-PDAM/drilled	Good		46			46
	Medium		11	1		12
	Bad				60	60
			57	1	60	118
Chi-square		<b>84.00</b>			DF	2

### Level of demand for electricity

The analysis was conducted to determine the relationship between electricity needs in 1990 and electricity needs by 2010. Analysis of the relationship/linkage is based on the assumption that electricity demand in 2010 (after the construction of the 'fringe-settlements') changes than demand for electricity in 1990 (before the construction of the 'fringe-settlements'). To support or test this assumption is necessary calculations through cross tabulation.

**Table 5.29** Level of demand for electricity in the opinion of the respondents

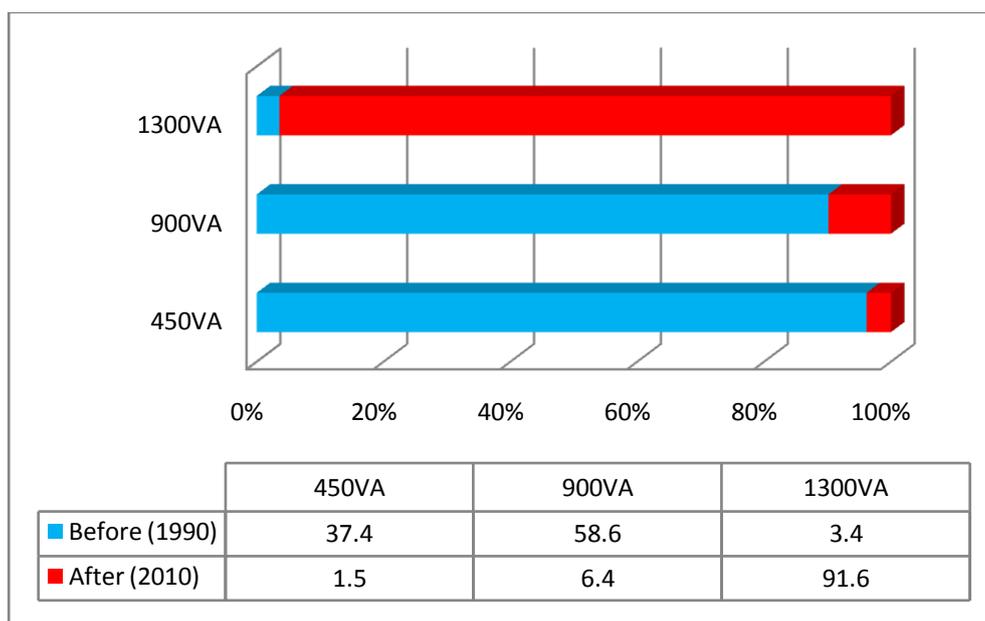
Electricity demand	'Fringe-Settlements'			
	Before		After	
	f	%	f	%
450 VA	76	37.4	3	1.5
900 VA	119	58.6	13	6.4
1300 VA	7	3.4	186	91.6
Total	202	100	202	100
<b>Chi-Square</b>			11.147	
DF	4			

The result of research in the field by using the sample population of 202 people as a respondent (only with a home-business) shows that 76 respondents or 37.4 per cent said that their electricity demand is 450 VA in 1990 (before the construction of the 'fringe-

settlements') and 186 respondents said that their electricity demand increase to 1300 VA in 2010 (no longer a 450 VA or 900 VA).

Table 5.29 and Figure 5.21 show that electricity demand in the study area is 37.4 per cent of 450 VA in 1990. In 2010, the condition increased to 91.6 per cent of 1300 VA.

The level of demand for electricity in 1990 (before the construction of the 'fringe-settlements') has a relationship to the level of demand for electricity in 2010 (after the construction of the 'fringe-settlements'). This condition evidenced by the Chi-Square (Count) with each degree of freedom (DF = 4) is greater than Standard Chi-Square (Table), namely, Chi-Square (Count) = 11.147 more than Chi-Square (Table) = 9.49 at 95 per cent confidence level (level of significance 0.05).



**Figure 5.21** Percentage of the level of demand for electricity in 1990 and in 2010

The calculation of cross tabulation results shows that 76 persons or 37.4 per cent of respondents have 'electricity needs' of 450 VA in 1990. In 2010, as many as 3 people or 1.5 per cent of respondents have electricity needs of 450 VA, 1 person or 1.32 per cent of respondents had increased power from 450 VA to 900 VA, and as many as 72 people or 94.74 per cent of respondents increased from 450 VA to 1300 VA.

Based on the result of research and observation in the field study shows that changes the level of demand for electric power is generally used for domestic/household (TV, refrigerator, iron, tape-radio, rice cooker, air conditioner/fan etc.), and it used for business. The people change the function of their building into home-businesses. It requires the electricity power is greater (Table 5.30).

**Table 5.30** Function of the building in 1990\*Function of the building in 2010\*Electric power needs in 2010

Electric power needs in 2010 (Volt Ampere)		Function of the building in 2010			Total
		Good	Medium	Bad	
450-VA	Other or residential and paddy field/moor		3		3
	Function of the building in 2010		3		3
900-VA	Residential/home only	12			12
	Other or residential and paddy field/moor		1		1
1300-VA		12	1		13
	Residential/home only	29	78		107
	Home-business		7		7
	Shops			1	1
	Other or residential and paddy field/moor		71		71
		29	156	1	186
Chi-square	<b>211.206</b>			DF	6

### 5.10 Recapitulation of physical change in the rural-urban fringe area

The detail of recapitulation of the influence of fringe-settlements to physical change in the rural-urban fringe area can be seen in the Table 5.31.

**Table 5.31** Recapitulation of the influence of fringe-settlements to physical change in rural-urban fringe area in the opinion of the respondents

No.	Indicators	Changes	Chi Square (Count)
1	Land-use	79.8% of dwellings: Land-use from agriculture has been changed into non-agricultural of land (residential and home-business)	<b>50.234</b> > Chi Square (Table) = 9.49
2	Building area	39.4% Building area: Building area to be increased	<b>110.275</b> > Chi Square (Table) = 21.03
3	Function of building	76.8% Home-business: The function of the building which was originally just ordinary residence changed into home-business	<b>242.523</b> > Chi Square (Table) = 16.92
4	Shape of the buildings	91.6% Good-shape: The shape of the building was better than the previous in 1990 (*before the construction of the fringe-settlements)	<b>4.727</b> > Chi Square (Table) = 3.84
5	Layout of the buildings	54.5% is not good-layout: The layout of the building is too close, so it affects the air temperature and environmental health	<b>36.639</b> > Chi Square (Table) = 3,84
6	Condition of neighborhood road	67.5% Good-condition: The condition of neighborhood road to be better (previously the ground turned into grass-block, and previously Mac-Adam turned into asphalt).	<b>25.559</b> > Chi Square (Table) = 5,99

To be continue

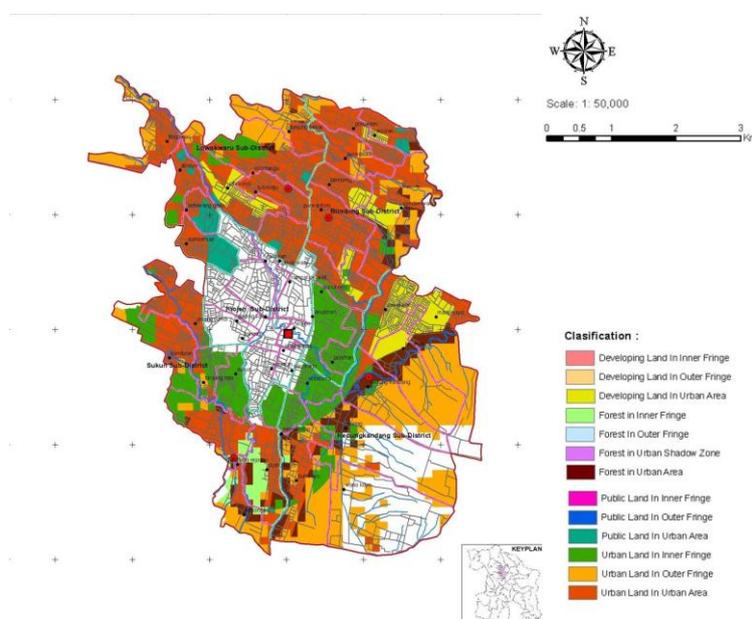
Continue of Table 5.31

No.	Indicators	Changes	Chi Square (Count)
7	Source of water	57.1% Good: Source of clean water most of non PDAM/wells (not from the river)	<b>92.025</b> > Chi Square (Table) = 3,84
5	Condition of waste services system	53.2% Bad-service: it is due to systematic waste services have not been going well especially the inadequate number of officers, and the waste hauler has not been precisely the time of transport.	<b>146.330</b> > Chi Square (Table) = 9,49
6	The level of demand for electricity	91.6% increase: The need for electricity has increased from 450 VA and 900 VA to 1300 VA	<b>11.147</b> > Chi Square (Table) = 9.49
7	The environmental of health	83% bad-level: The environmental of health at the study site is worst than before	<b>144.504</b> > Chi Square (Table) = 5.99
Total of condition		Physical facilities and infrastructure to be better, but the condition of health environment is bad-level. So, the health of the environment and green spaces/agriculture land also needs attention.	

## 5.11 The Pattern of development of the region of space in rural-urban fringe area because of the development of fringe-settlements

### The pattern of changes in land use

Figure 5.22 showed that the pattern of land use change from field / fields to the settlement is 'shaft model' with a spread of the space 'star-shaped pattern/octopus-like pattern'. In this pattern, 'fringe-settlements' became the center of the shaft while the transportation into the link between 'fringe-settlements' with rural-urban fringe areas.



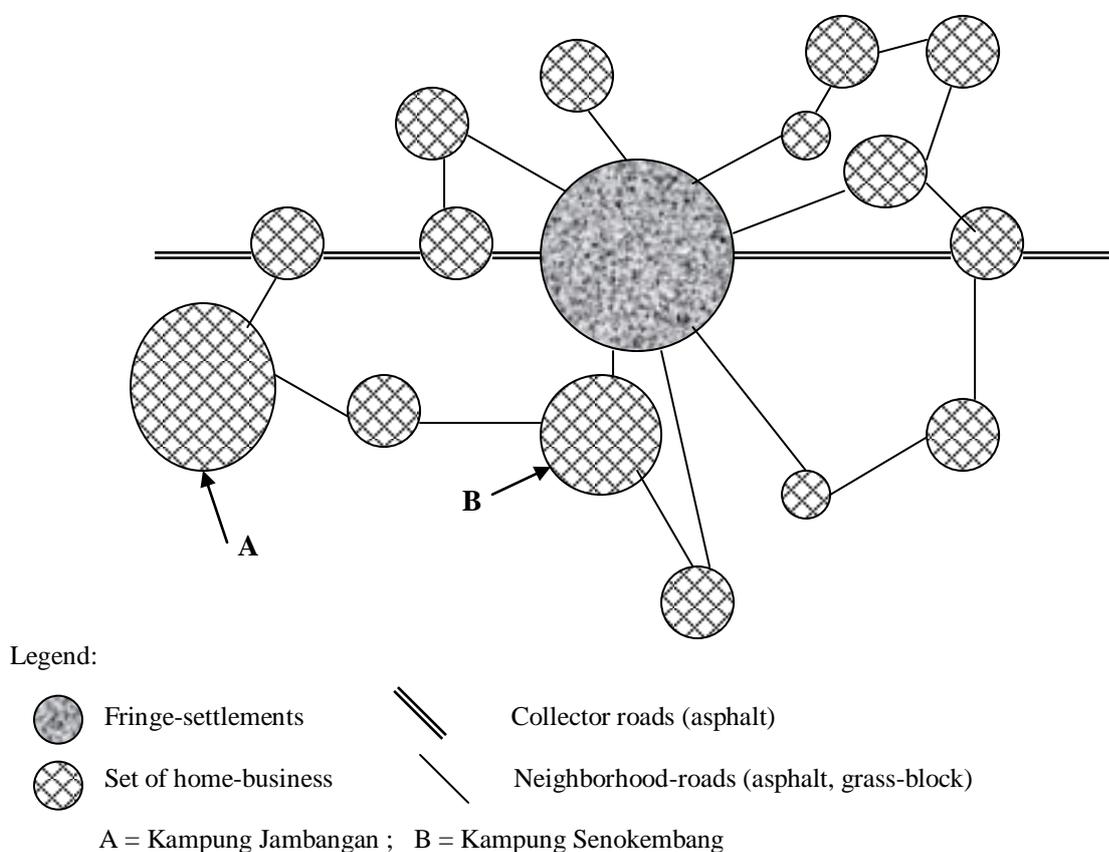
**Figure 5.22** The pattern of land use changes of the study area in 2010

The region through which the transport has 'physical development' is different from the regions between the transport links, this is the cause of star-shaped pattern.

### The pattern of distribution facilities

The survey results in the field shows that the pattern of distribution facilities (for home-business) that is in the dwellings of rural-urban fringe area around the 'fringe-settlements' is a form of 'scattered constellation' that is, the distribution of houses 'scattered sporadically' and there are some that grew up in the farmland or agriculture land. It can be described in Figure 5.23.

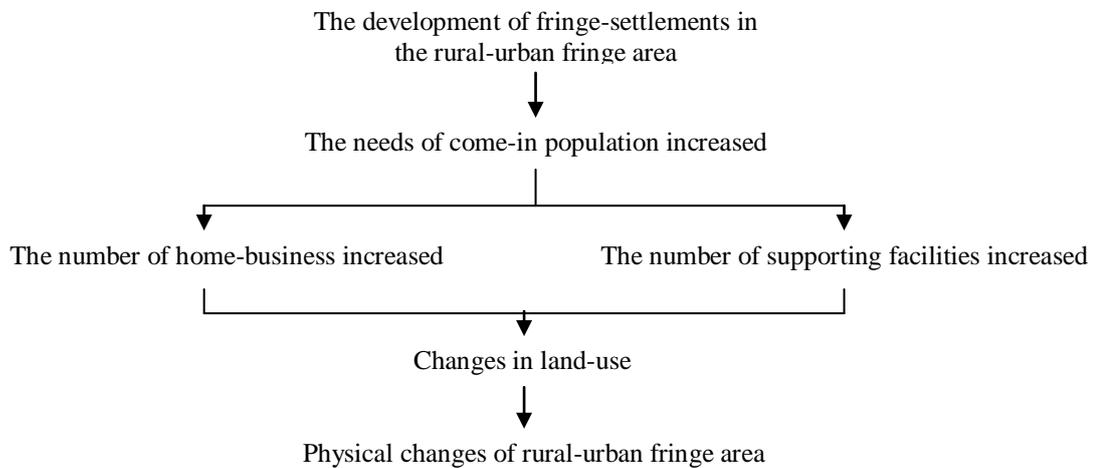
One more factor that causes the pattern of distribution facilities in the area of fringe-shaped scattered settlements is a priority 'immigrant' (come-in population) in choosing a place to live. From the field survey on the priorities of 'immigrants', in choosing a place to live known that as many as 71.01 per cent of respondents (immigrants) to prioritize a strategic location in choosing a home. Total of 16.57 per cent of respondents prioritize a good-home, and as much as 12.43 per cent of respondents to prioritize a relatively cheap price in choosing a home.



**Figure 5.23** Form of 'scattered constellation' in Pandanwangi

Based on research sample map, it described that most home-business are close to the road, and a small portion in the middle of the settlement. The total of home-businesses are close to the road is possible because in building home-business besides being close to the 'fringe-settlements', 'immigrants' will tend to choose home-businesses are close to the road. This situation shows that the existence of roads in a region will affect the development of the region. The existence of the road in an area related to the form of ease of accessibility issues in achieving the goals. Thus, the locations are near the road will grow faster when compared with areas that do not have roads. This is because the community will be more likely to build in locations that are near the road. So they are easier to reach the goal.

Schematically, the relationship between the presence of fringe-settlements, 'home-business' and other facilities in rural-urban fringe area can be described in Figure 5.24.



**Figure 5.24** The relationship between the presence of fringe-settlements, 'home-business' and other facilities in rural-urban fringe area

The phenomenon is happening, where more home-business, the more are also facilities at the sites. Close location to the 'fringe-settlements', the more home-businesses and facilities that are found. Conversely, the farther from the 'fringe-settlements', the fewer facilities are found.

It is obvious that this activity when viewed from the side of the home-business owners have a positive influence. So it is natural that business activity is expanding. Communities used to work their land for farming, many are changing their activities into the home-business owners. Some other people who still work in accordance with the type of work but they adds to its business by providing home-business.

If this is seen from the 'spatial', there is a lot of business activity causes changes in the face of an area. This situation occurs because the rural-urban fringe areas close to the 'fringe-settlements' which was once the paddy fields or vacant land that is not utilized. It has turned into dense buildings.

### **The pattern of neighborhood road**

Overlay map of land use in 1990-2010 indicates a change in the condition of the neighborhood road (especially in the areas of research). Here, we can see that the road environment at the study site patterned 'angled' or 'grid system' (grid). Where, roads are experiencing changes in environment conditions seen in such a way divided into blocks of rectangular shape right angle.

The pattern of 'neighborhood road' at the study site patterned angled or grid system is closely related to the use of plots of land and existing buildings.

### **The pattern of home-business growth**

The field survey indicates that the pattern of the growth building at the study site is vertical because of the increasingly high price of land. It gives the impression of the environment looks crowded and irregular.



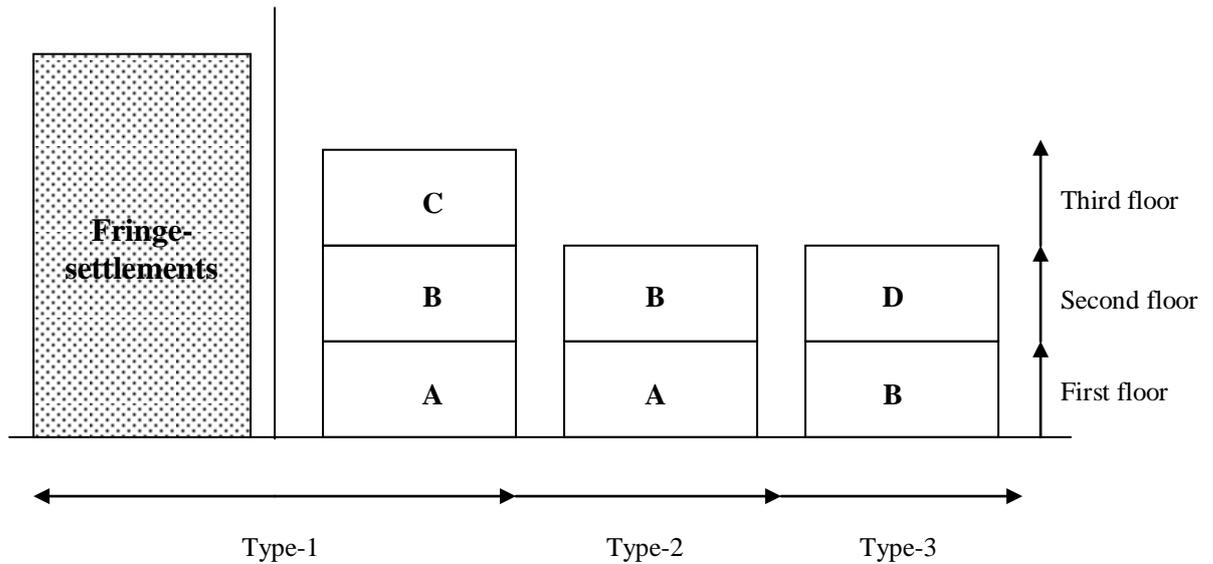
**Figure 5.25** Home-business in rural-urban fringe area close to the fringe-settlements (\*Pondok Blimbing Indah and Purwantoro Agung)

The pattern of the building growth a vertical is related to the function of the buildings owned by the respondent. "Ground floor" used by the 'function' has the most powerful economy. In this case, the "retail activities" is the most commonly used (Figure 5.25 and Figure 5.26).



**Figure 5.26** Home-business in rural-urban fringe area close to the fringe-settlements (\*Pondok Blimbing Indah)

The one factor that led to the building is a vertical growth pattern is related to land use and distance to the 'fringe-settlements' as a center of activity. More details can be seen in Figure 5.27.



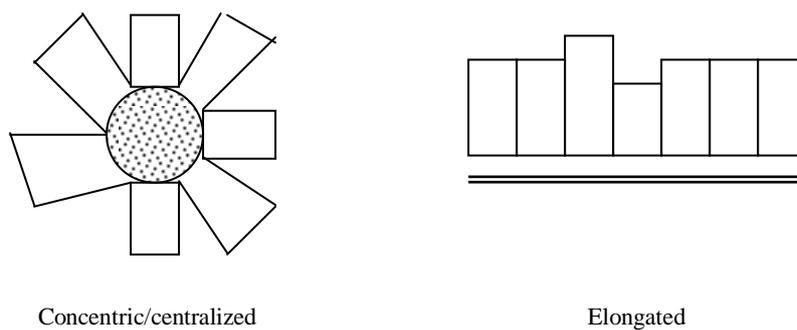
Legend:

- A: Retail Activities (Eating stalls, Internet cafe, Daily shops, Photo copy joined the owner house)
- B: Business
- C: Business
- D: Residential/Home

**Figure 5.27** The relationship between the function of buildings in rural-urban fringe area and the distance to the fringe-settlements

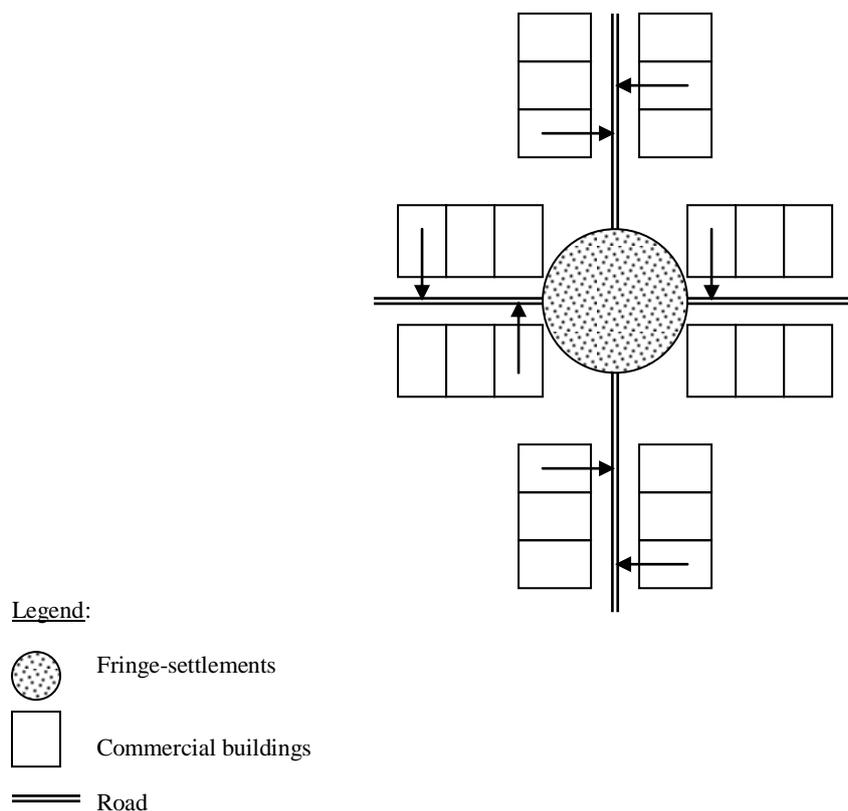
**The pattern layout of buildings home-business**

The pattern 'layout of buildings' on the other building there is a concentric or centralized (Pattern-1) and the buildings that are elongated pattern (Pattern-2). It can be seen in Figure 5.28.



**Figure 5.28** The pattern 'layout of buildings' on the other building

The pattern 'layout of buildings' to the building is elongated because it follows the path of transport (road). Meanwhile, building patterns on the buildings are centralized because it is influenced by the 'building plots' that already exist and where the previous building.



**Figure 5.29** The pattern 'layout of commercial buildings' linear on the road

For buildings of a commercial character (food stalls, cafe, restaurant, telecom-shops), the location of the building is a linear pattern on the road. The location of the building follows the path of transport (road). It can be seen in Figure 5.29.

**Table 5.32** Recapitulation of spatial pattern in the rural-urban fringe area

No.	Indicators	Pattern	Causative Factor
1	Land use	Star-shaped pattern	This is influenced by transportation routes, and transportation facilities.
2	Distribution facilities	Scattered constellation	This is influenced by the distance to the 'fringe-settlements', the travel time, transportation facilities, and land values.
3	Other commercial facilities	Ribbon/linear	This is influenced by the transportation routes (roads) and distance to the 'fringe-settlements
4	Neighborhood road	Grid system	This is influenced by lots of buildings, land use and building function.
5	Growth of building	Vertical	This is influenced by the value of land and limited horizontal space.
6	Layout of building on the road	Linear	This is influenced by transportation routes (roads) and distance to the 'fringe-settlements' as a center of activity and proximity to settlements.
7	Layout of the home-business of other buildings	Concentrated	Concentrated is influenced by lots of buildings and the location of the previous building that has been established. Elongated is influenced by transportation routes (roads).

## 5.12 Discussion and Conclusion

Physical changes occur in the rural-urban fringe area due to the existence of 'fringe-settlements', among others:

- There was a significant change in land use from paddy fields into settlements
- Building area changes becoming increasingly 'wide building' because respondent adds their house to be used as a place of business.
- Function of the building changed, which was originally 'residential' become home-business.
- Changes in conditions of neighborhood road previously the dirt road/rocks into the asphalt road.
- Demand for electricity changed, from 450 VA to 900 VA and from 450 VA and 900 VA to 1300 VA. Due to changes in house-building functions into the business so that demand for electricity increases.
- There is a change shape of the building to be better. With home-business, people get additional income, which is used to renovate the 'form of their building'.
- There is a change layout of the buildings to be not good-layout, because many home-business that are located too close to one another thereby affecting the air temperature and environmental health.
- There is a change for the bad-waste service, it is due to systematic waste services have not been going well especially the inadequate number of officers, and the waste hauler has not been precisely the time of transport. Meanwhile, the amount of waste increases progressively with increasing resident and the layout of the building is not-good. This affects the waste service into a bad system.
- Source of water changed, which originally is still a lot to get water from the river is now sourced from PDAM and wells.

As a result of the influence of the development of 'fringe-settlements' occurred-specific patterns in the rural-urban fringe areas, namely:

- The pattern of land-use change is star-shaped pattern. This influenced by transportation routes/roads, and transportation facilities.
- The pattern of 'distribution facilities settlement' is a scattered constellation. This is influenced by the distance to the 'fringe-settlements', the travel time, transportation facilities, and land values.
- The distribution pattern of other commercial facilities (cafe, copy, store, diner) is a ribbon/linear. It influenced by the transportation routes (roads) and distance to the 'fringe-settlements'.
- The pattern of neighborhood road is angled or grid system. This is influenced by lots of buildings, land use and building function.
- The pattern of growth of the building is vertical. This is influenced by the value of land and limited horizontal space.
- The pattern 'layout of buildings' on the road is linear for commercial buildings (food stalls, shops, cafes, etc.). This is influenced by transportation routes (roads) and distance to the 'fringe-settlements' as a center of activity and proximity to settlements.
- The pattern of layout of the buildings (home-business) of other buildings concentrated and elongated. Pattern concentrated is influenced by lots of buildings and the location of the previous building that has been established. The pattern of elongate is influenced by transportation routes (roads).

For the establishment of new fringe-settlements should be established in areas that still have a large area, and that is not the area of agriculture. This is because the existence of the fringe-settlements will influence the development of rural-urban fringe area. If the fringe settlements built in the agricultural area, it would have caused many problems especially in terms of land use.

In fact, the development of 'fringe-settlements' gives considerable influence on the physical changes in the rural-urban fringe area and the social-economical society. This proves that the 'fringe-settlements' is the trigger new growth of a city/region. For that reason, there needs to be regulation of the 'fringe-settlements' and home-business to being focused and organized.

### 5.13 References

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## **CHAPTER 6**

### **AN APPROPRIATE STRATEGY TO ANTICIPATE URBAN DEVELOPMENT IN RURAL-URBAN FRINGE AREA BASED ON COMBINATION MODEL**

#### **6.1. Introduction**

The rural–urban fringe is the landscape located just outside of established cities and towns, where the countryside begins. The fringe characterized by diversity in land uses, with many areas in continuous transition (Friedberger, 2000; Sullivan and Lovell, 2006).

Land conversion has both direct and indirect consequences. The direct impacts include loss of prime agricultural-land, loss of agricultural jobs, loss of investment in irrigation infrastructure in the areas, and natural landscape destruction and excessive exploitation of groundwater (Bryant et al., 1982; Lockeretz, 1989; Firman, 2000). Land conversion in Indonesia has occurred at a large scale. Hence it could greatly affect the production of foodstuffs, as well as waste investment in irrigation of agricultural-lands, notably the paddy fields. There is no evidence that any country has been able to limit agricultural-land conversion successfully without causing high pressure on land prices for other purposes (Bernstein, 1994; Firman, 2000).

Attention balanced and proportionate course required in the development of rural-urban fringe area. It is related to the growing land conversion in the rural-urban fringe area. Urban development is necessary for the growth of regional and national economy while the character development of provincial resources aimed at saving food and the importance of environmental balance. Then the objective of expansion which rural characteristic is balancing environment. It is difficult to implement this development orientation because of many experts think that in reality the interests of their respective opposites. That's why many experts emphasized the problems of unmanaged land use controls and high conversion rate in rural-urban fringe areas.

This research is concerned with land use between urban, rural, characteristic of rural-urban fringe area, and an appropriate strategy to anticipate urban development in the rural-urban fringe area. Land use as a human activity product on earth's surface shows a large variation, within both local and regional city. An understanding of land use forms that characterize the built-up area, urban-rural transition area, and the countryside itself is a matter of principle to do its spatial structure differentiation. An understanding of "urban" and "rural" also needs attention - especially "urban" related to urban life and "rural" associated with countryside life. Aspects of life itself consist of urban and countryside aspects: political, social, economic, cultural, psychological, technological, and physical. In discussing this morphological approach, someone insisted on the physical aspect, and one of which is land use.

Rural-urban fringe area is the most important area in the city because if city center is insufficient, the target of urban development will move to the rural-urban fringe area. In fact, it is difficult to trace boundaries of rural-urban fringe area clearly because of mixing of urban and provincial properties in an area once. This research investigates this problem by combination model using GIS function. The main purpose of this study is to improve the

policy of rural-urban planning related to anticipate urban development in the rural-urban fringe area. We firstly discuss combination model to identify rural-urban fringe area location using GIS function. Secondly, we analyzed characteristic changes of rural-urban fringe area using combination quantitative and qualitative methods. Thirdly, we examine an appropriate concept and strategy related to anticipate urban development in the rural-urban fringe area.

## **6.2. Land use and rural-urban fringe**

There are many studies about land use changes at the national scale as well as smaller scale, such as cities or villages (Himiyama, 1994, 1998; Hoshino, 2001; Verbist et al., 2005). These studies have regarded a region as an aggregated system which can be used to estimate only amount of land-use change (Rustiadi and Kitamura, 1998). Braimoh and Onishi (2007) identified the factors responsible for residential and industrial/commercial land development in Lagos. They classified land use into four: (1) Residential, (2) Industrial/commercial, (3) Non-urban, and (4) Water.

T.L. Smith's (1937) discussion of the "urban fringe" around Louisiana marked the first use of this term signifying "the built-up area just outside the corporate limits of the city". Kurtz and Eicher (1958) differentiate between "fringe" and "suburb"; Wissink (1962) defines "fringe", "suburbs", "pseudo-suburbs", "satellites" and "pseudo-satellites"; and a number of writers have described different types of suburbs, some of which could be synonymous with the "fringe" of another research worker.

Pryor (1968) calculated the percentage of urban land use, percentage of provincial land use and percentage of distance from the main urban area. The three components are combined in the rural-urban land use triangle model. The creation of this model based on the idea of gradual transformation from city to village or vice versa. The 'distance decay principle', where the further away from the 'real urban' appearance will increasingly blur in the town, also applies here. In contrast, the village became clear appearance. In other words, it can be expressed that the dominance of urban land use forms will increase if it closes to urban area and vice versa.

Yunus (2000, pp. 168-169) adds new sub-zones in sub-zone differentiation according to Pryor (1968). They are located between the urban fringe and rural fringe: (1) urban area; (2) urban fringe; (3) urban-rural fringe; (4) rural fringe, and (5) rural area. Slightly different from the opinion of Pryor and Yunus, especially in areas that lie between the "real urban" and "real rural", Russwurm suggested three sub-zones: (1) inner fringe; (2) outer fringe, and (3) urban shadow zone (Yunus, 2000, pp. 167-168). Russwurm also identified regional rural-urban fringe (the term of Pryor). This structure, based partly on Russwurm (1975b, 1977a) and Bryant (1982), is particularly helpful, since it stresses the notion of a continuum between urban area and rural hinterland.

Studies of land-use change and rural-urban fringe have been superficial in many regions. It seems that rural-urban fringe neglected because of the difficulties of grasping the spatial relationships between land-use changes and rural-urban fringe location.

## **6.3. The role of GIS in spatial**

GIS is a powerful set of tools for storing and retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes (Burrough, 1986). Clarke (1997) explained that GIS is automatic systems for the capture, storage, retrieval, analysis and display of spatial data. One feature of the GIS is a subsystem of manipulation and analysis of data that can serve as a model. GIS modeling ability is not independent of its ability that can interactively display results of the process when an input is changed (DeMers, 1997).

## 6.4. Research method

### 6.4.1. Approach

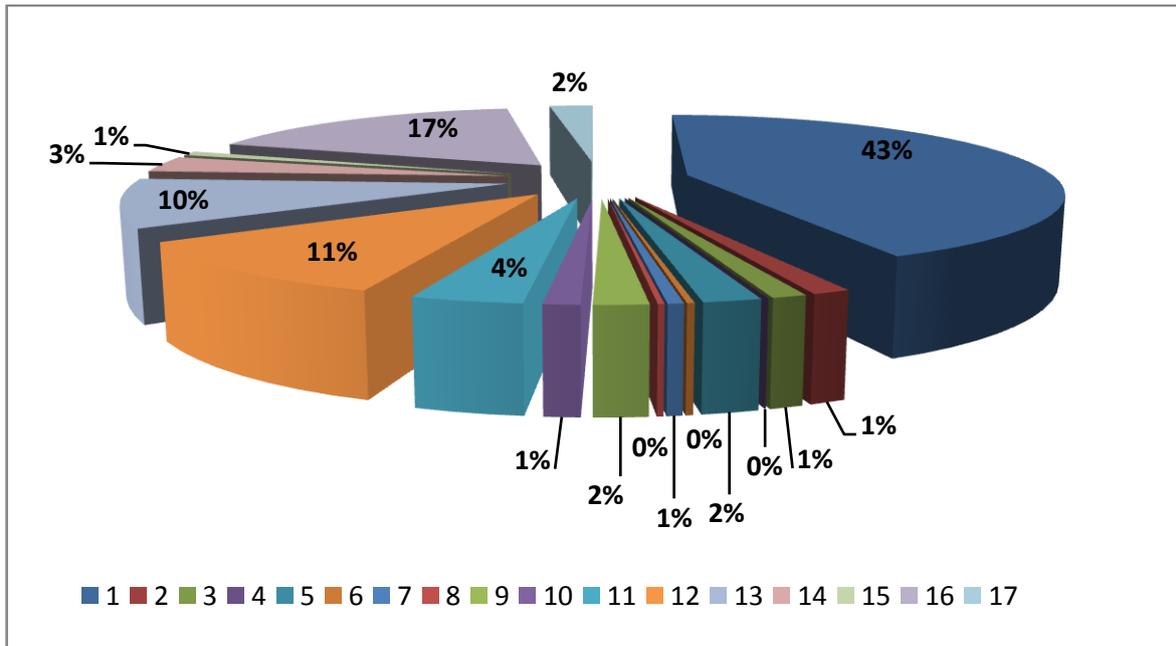
Aerial photographs were taken in 1990, 2000, and 2010 and are used as the data for the research. Based on these data, 17 classifications were identified (Table 6.1). It was difficult to obtain the data of land use every five years. We created digital maps of four types of land-use with grid data (Figure 6.2).

The 17 classifications divided into four land-use types: forest/farmland (f); urban-land (u); public-land (p); developing-land (d). The overall classification system is shown in Table 6.1.

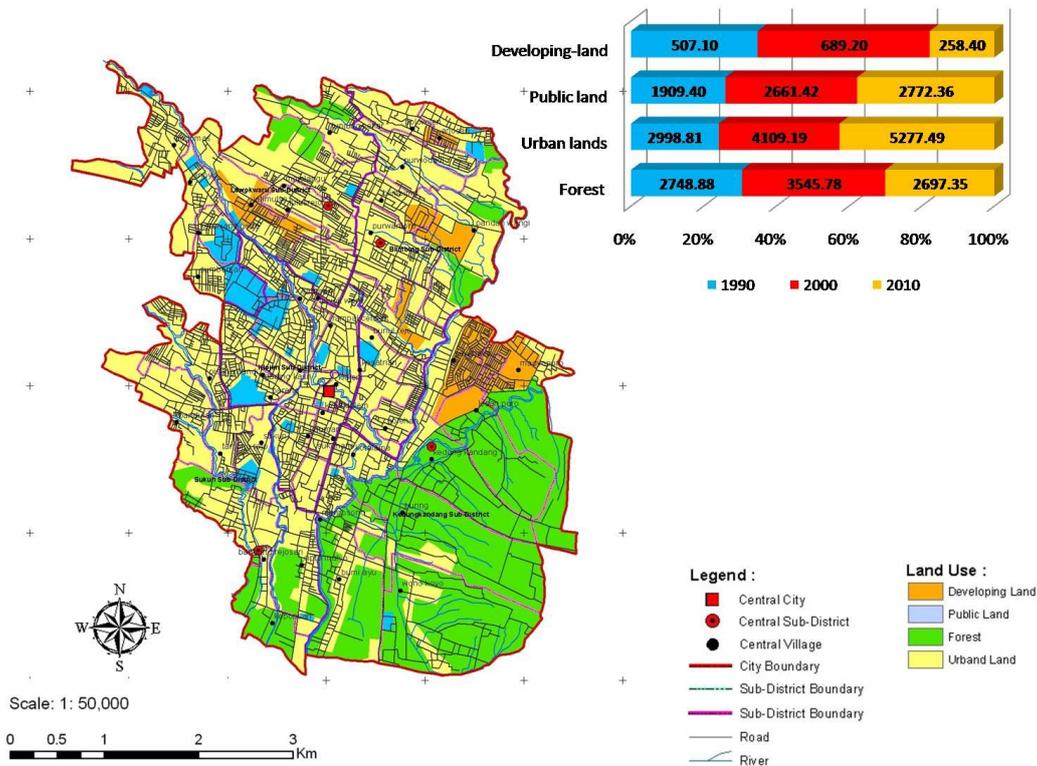
**Table 6.1** Classification of land-use types

Land use types	No.	Classification
Forest and farmlands	1	Paddy field
	2	Moor
	3	Plantation
Urban lands	4	Dwellings
	5	Industrial
	6	Office affairs
	7	Military
	8	Commercial
Public land	9	Terminal
	10	Road/drainage
	11	Education
	12	Liturgy
	13	Recreation
	14	Water reservoir
	15	Healthiness
Developing land	16	Green space
	17	Vacant

The percentage of land-use types in each period obtained by overlapping land-use map and grid data (Figure 6.1 and Figure 6.2). The percentage of dwellings, industry, office-affairs, military, commercial, and public land occupied more than 80 per cent. Forest and farmland occupied less than 20 per cent.



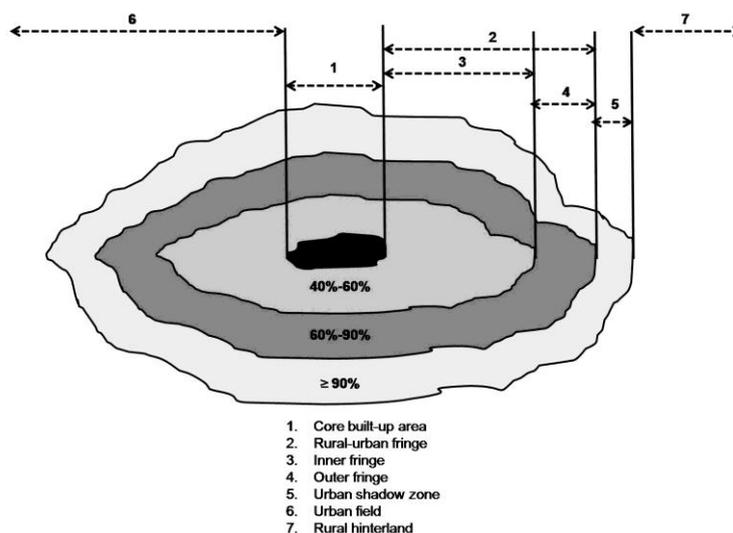
**Figure 6.1** Classifications of land use in 2010. 1: dwellings, 2: trade/services, 3: green space, 4: recreation, 5: education, 6: healthiness, 7: office affairs, 8: liturgy, 9: industrial, 10: military, 11: plantation, 12: moor, 13: paddy field, 14: terminal, 15: water reservoir, 16: road/drainage, 17: vacant



**Figure 6.2** Land-use types in 1990 to 2010

In this research, we used a combination model to identify rural-urban fringe area location. In this model, rural-urban fringe area location is determined by the proportion of urban land-use functions and residential properties and the proportion of agricultural land-use. It also

calculated based on the distance bands and square grid (Figure 6.3). The basic research division of rural-urban fringe area location is divided into two sub-zones: The first is inner fringe, in which non-agriculture land began to be dominant. The built-up environment and the natural environment are balanced (40 per cent to 60 per cent of agricultural and conservation areas). It covers around 2 kilometers from city center. The second sub-zone is outer fringe, in which land use is dominated by provincial features (60 per cent to 90 per cent of agricultural and conservation areas). It covers an area more than 2 kilometers and up to 5 kilometers.



**Figure 6.3** Combination model (Agustin and Kubota, 2010)

Morphological identification of cities in the study area entailed dividing the grid area of the city based on observations of cells of each area of 4 hectare. Each of these observation cells count the ratio of land to produce cells belonging to the category of inner fringe and outer fringe. Then, in order to know the administrative area of the three categories above, the urban fringe areas are grouped into the same village administration. To combine square grid and distance bands, we used Geographic Information System (GIS) software (ArcGIS 9.3), and ArcMAP.

For the manufacture of the grid, we utilize pre-existing secondary data such rates 400mx400m. After that, we create a separation layer of each map is needed and make the observation grid where each cell of the same size i.e. 200mx200m. We make an analysis "intersection" of the base map overlay in the observation cell. Then we crosscheck the results of the intersection in the observation cell with the classification of types of rural-urban fringe areas based on combination model. Then, we proceed with giving the name of each cell. The horizontal giving the name using letters "A", "B", "C" and the vertical using the number "1", "2", "3". After the cell completed, we create an overlapping (INTERSECT) with the "base map" so that the grid cell can be fused with the "base map" (Figure 6.4).

The result for the three years was then compared, with the purpose of identifying the land use type changes that had occurred over the 20-years period.

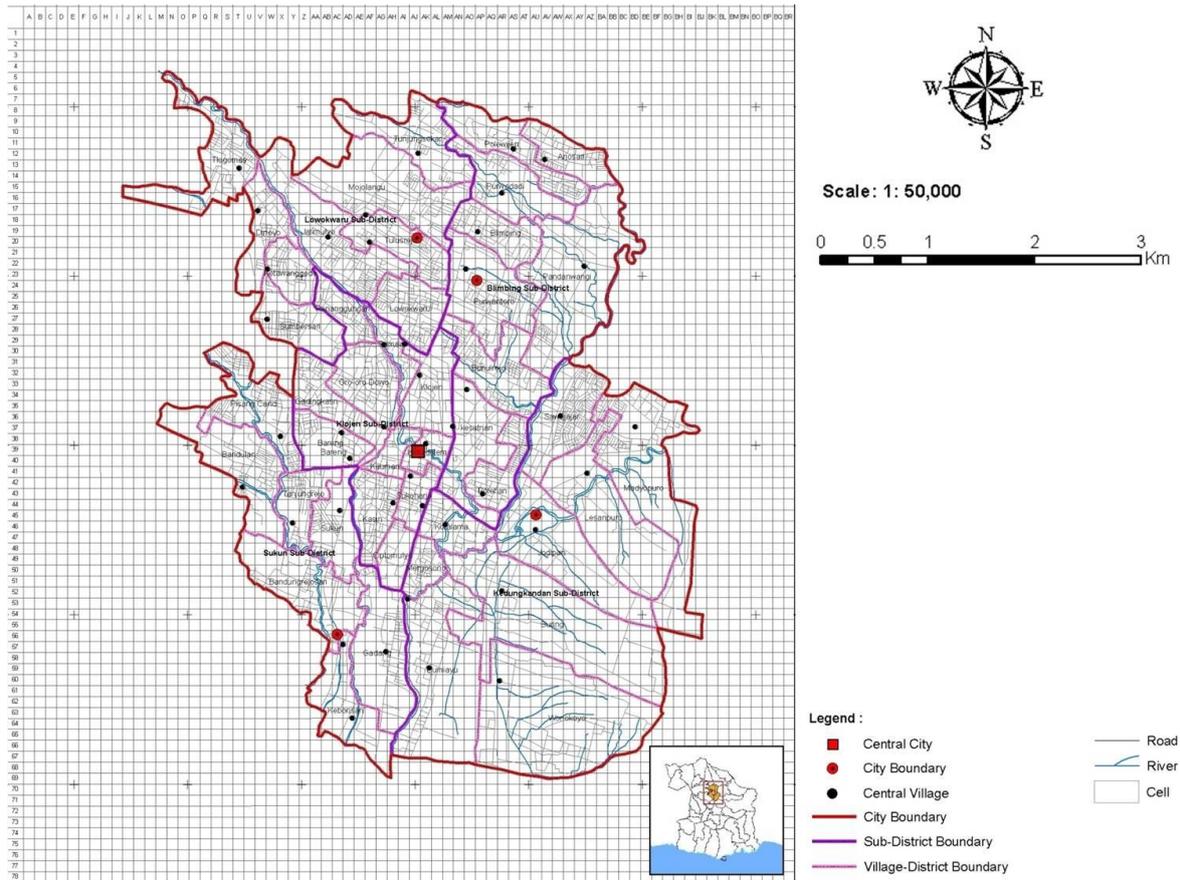


Figure 6.4 Observation cells in study area 2010

### 6.4.2. Analysis of population growth

The method is used to determine the level of population growth (population distribution), so as to anticipate the policy measures affecting the population development of operational aspects of growth control in the study areas. It is also used to determine the level of population density. All the model calculations will be done. Finally, we selected a model with a small deviation level.

### 6.4.3. Analysis of agricultural-land reduction

Agricultural lands reduction as the basis for analyzing the pattern of regional development in the rural-urban fringe area because it is a tangible result of the impact of residential development or urban functions. Agricultural-land of each village compared in the last 20 years at the observation points in 1990, 2000, and 2010. Comparison of agricultural-land reduction obtained the pattern of development in the region between 3 kinds of spatial context of rural-urban fringe. The agricultural-land reduction was calculated using the following equation:

$$P_{elp}/year = \frac{L_{lp} \left( C_1 \right) - L_{lp} \left( C_2 \right)}{d} \quad (1)$$

where  $P_{elp}$  means agricultural-land reduction (hectare pe year),  $L_{lp}$  means agricultural-land area (hectare),  $t$  means time (year), and  $d$  means difference in time (year).

#### 6.4.4. Analysis of additional of residential-land

Additional of residential-land in rural-urban fringe area is a result of the centripetal and centrifugal force and the lateral movement towards the region. Population growth encourages migration to the rural-urban fringe area to encourage the construction of residential-land annexed green lands in urban fringe area. Examining of the pattern of residential-land additional found that some of the rate of urbanization leading to the rural-urban fringe area. Additional of residential-land was calculated using the following equation:

$$P_{nlp} / \text{year} = \frac{L_{lnp} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right] L_{lnp} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right]}{d} \quad (2)$$

where  $P_{nlp}$  means additional of residential-land (hectare per year),  $L_{lnp}$  means residential-land area (hectare),  $t$  means time (year), and  $d$  means difference in time (year).

#### 6.4.5. Analysis of additional of non-agriculture land and residential-land

This analysis is similar to analysis of additional of residential-land. The subject of analysis is non-agriculture land and residential-land. The purpose of this analysis is to find out the rate of additional of non-agriculture land and residential-land as a process of development toward the rural-urban fringe areas. Additional of non-agriculture land and residential-land was calculated using the following equation:

$$P_{nlnp} / \text{year} = \frac{L_{lnpn} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right] L_{lnpn} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right]}{d} \quad (3)$$

where  $P_{nlnp}$  means additional of non-agriculture land and residential-land (hectare per /year),  $L_{lnpn}$  means non-agriculture land and residential-land area (hectare),  $t$  means time (year), and  $d$  means difference in time (year).

#### 6.4.6. Analysis of acceleration of urban sprawl

Analysis of acceleration reduction of agricultural-land intended to determine the rate of acceleration of the "urban sprawl" in the rural-urban fringe area. If the number of acceleration is high, it means that the acceleration of urban sprawl is slower in the rural-urban fringe area. Acceleration of urban sprawl index was calculated using the following equation:

$$A_{hlp} / \text{year} = \frac{L_{lp} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right]}{L_{lp} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right] L_{lp} \left[ \begin{array}{c} \curvearrowright \\ \curvearrowleft \end{array} \right]}{d} \quad (4)$$

where  $A_{hlD}$  means acceleration of urban sprawl index,  $L_{lD}$  means agricultural-land area (hectare),  $t$  means time (year), and  $d$  means difference in time (year).

#### 6.4.7. Analysis of SWOT

SWOT analysis is a qualitative descriptive method where the aim of this analysis is to know the strengths, weakness, opportunities and threats, control of urban development in the study area based on its characteristics and its existing condition. SWOT analysis is used to facilitate in:

- Provide an overview of the issues that need to be indicated for certain purposes.
- Giving the current situation and future scenarios that will become an explanation of each potential performed by descriptive analysis.

The steps of workmanship SWOT analysis, based on the study are as follows:

- Determining existing condition that affects development in this area of land use changes in rural-urban fringe areas, to see the opportunities, strengths, weaknesses and threats that can affect urban development in the area of rural-urban fringe.
- From the matrix of SWOT analysis obtained by any factor which is strength, weakness, opportunities and treatment will then be interpreted qualitatively so that later on known and potential development opportunities owned.

#### 6.5. Study area

The present study selected four sub-districts and 23 villages, which have a total area of about 8164.33 hectare (Figure 6.5). In 2010, there were 816,637 inhabitants (Statistic of Malang City, 2009). The study area located between  $112.06^\circ$  and  $112.07^\circ$  (East longitude) and  $7.06^\circ$  to  $8.02^\circ$  (South latitude).

The study area has a topography that is most flat (96.3 per cent) with slope 0 per cent to 15 per cent and a height of 380 meters to 667 meters above sea level (Figure 6.6).

#### 6.6. Data collection

Data regarding farmer, housing acquisition, farmer's commitment to agricultural-land and agricultural activities have been collected using a questionnaire that was distributed in September 2009 and July 2010. The region of population sample was taken in the rural-urban fringe area which has been determined using the technique of Non-probability Sampling. Respondents were selected using purposive sampling method where respondents are not determined in advance. The population in the study is farmers and come-in population in the area of rural-urban fringe. Then, the number of samples was determined after the discovery of the location of rural-urban fringe area. This research collected 184 farmers and 184 come-in population that were required to fill in the questionnaire.

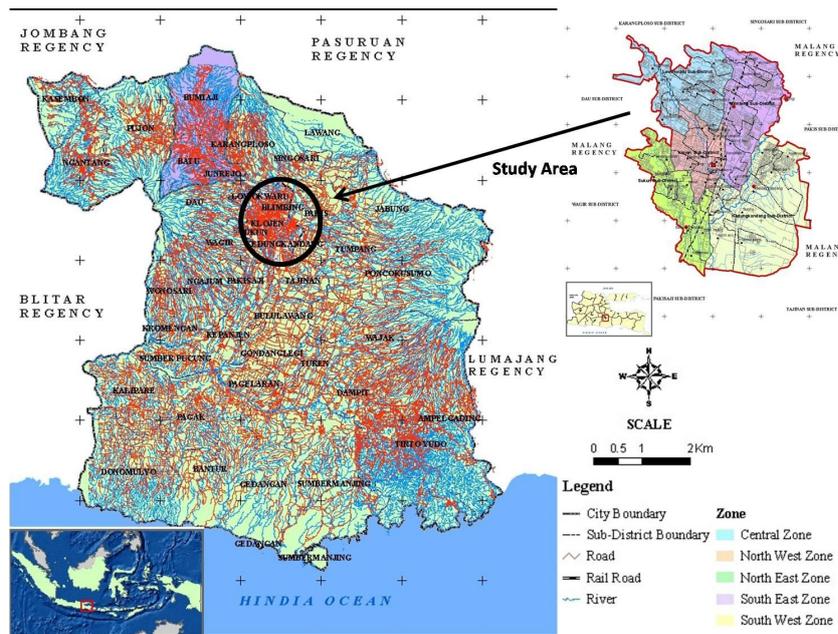


Figure 6.5 The location of study area and the study area showing the four sub-districts and their boundaries

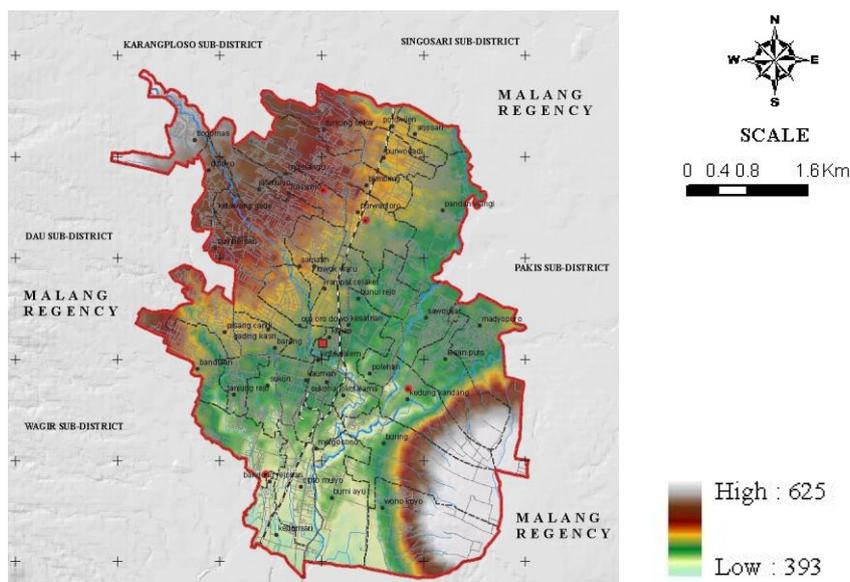


Figure 6.6 Digital elevation model of the study area

### 6.6.1. Questionnaire

The questionnaire is divided into two parts. The front page of this questionnaire is the introduction to the respondent that explains the purpose, the person in charge, and the contact address. The first part for farmers, we ask their commitment to their agricultural-land and agricultural-activities. It consists of 10 general questions. The second part for come-in population, we ask their job and their reason come to the rural-urban fringe area. It consists of 15 general questions.

### 6.6.2. Method of survey

The data collection was conducted in September 2009 and July 2010. Ten surveyors (including one coordinator of surveyors) distributed the questionnaire directly to farmer's house and come-in population's house, the surveyors approached the farmers and come-in population personally to kindly ask him/her to fill in the questionnaire. The surveyors assisted/accompanied by one of the village officers. In this case, we co-operate the office of the local village because it is easier for surveyor to guide the respondent when completing the questionnaire. Sometimes the surveyor is reading out the question to the respondent in case the respondent could not read it, up to translating the questionnaire into a local language (*Bahasa Jawa*) if the respondent was not able/understand the national language (*Bahasa Indonesia*), especially for farmers who have a slightly different character and a low level of formal education, since the questionnaire was written in Indonesian. On average, the success rate of gathering respondents willing to complete the questionnaire was quite high. It was known by making a note of the number of respondents that filled in the questionnaire.

### 6.6.3. Descriptive statistics

In this survey, the respondents who fill out the questionnaire divided into two parts. The first part is 184 questionnaires for farmer. The second part is 184 questionnaires for come-in population, after reviewing the completeness of the answers, finally 368 questionnaires used for further analysis. The descriptive statistics of the respondents are provided in Table 6.2 and Table 6.3. It is important to notice the high percentage of education level of farmers in rural-urban fringe area. Low level of education of farmers seems to dominate in the rural-urban fringe area.

**Table 6.2** General characteristics of respondents (farmer; n=184)

No.	Characteristics	Statistics
1	Sex	Male (95.7%), Female (4.3%)
2	Age	31 to 40-year-olds (16.3%), 41 to 50-year-olds (39.7%), more than 51-year-olds (44%)
3	Place of living	Blimbing (25%), Lowokwaru (4.3%), Sukun (20.7%), Kedungkandang (50%)
4	Family members	1 (59.8%), 2 (8.7%), 3 or more members (31.5%)
5	Last education	Elementary School (38.6%), Junior High School (28.3%), Senior High School (19.6%), Other (13.6%)
6	Kind of income distribution	Occupational activity (57.1%), Two occupational activities (35.9%), More than two occupational activities (7.1%)
7	Experience about decreasing of agricultural production	Yes (81%), No (19%)
8	Tips to overcome reduction of agricultural production	Intensification (46.2%), other (53.8%)
9	Still keep the function of agricultural-land in 2010	Yes (52.2%), No (47.8%)
10	Maintain employment as a farmer in 2010	Yes (54.3%), No (45.7%)

**Table 6.3** General characteristics of respondents (come-in population; n=184)

No.	Characteristics	Statistics
1	Sex	Male (92.9%), Female (7.1%)
2	Age	21 to 30-year-olds (10.9%), 31 to 40-year-olds (41.3%), 41 to 50-year-olds (37.5%), more than 51-year-olds (10.3%)
3	Place of living	Blimbing (25%), Lowokwaru (4.3%), Sukun (21.7%), Kedungkandang (48.9%)
4	Hometown	Outside Malang (52.2%), Outside East Java (29.3%), Outside Java island (18.5%)
5	Family members	1 (17.9%), 2 (60.3%), 3 or more members (21.7%)
6	Last education	Senior High School (28.8%), Under graduate (58.7%), Post Graduate (12.5%)
7	Reason living in RUF	Job or business (88.6%), other (11.4%)
8	Current occupation	Merchant (50%), Entrepreneur (2.7%), Public servant (25.5%), Army or Police (3.8%), Retired (10.3%), Other (7.6%)
9	Second job	Farmer (20.1), Merchant (27.7%), Entrepreneur (3.3%), None (14.1%), Other (34.8%)
10	Type of land-use before	Paddy field (54.9%), Moor (14.7%), Other (30.4%)
11	Type of land use after	Other (100%)
12	IMB for building	IMB (100%)
13	Ease of the maintenance of IMB	Easy (96.7%), Difficult (3.3%)
14	The kind of ease of IMB	Incentives or financial convenience (7.6%), Ease of administration or handling (89.1), none (3.3%)
15	Building	Buy so (7.6%), Heritage (28.3%), Build your own (64.1%)

### 6.7. Rural-urban fringe area location based on combination model

The total of rural-urban fringe area based on combination model is 677.47 hectare or 8.30 per cent of the total area of the city. According to the classification, the dominance of the first area is the outer fringe area of 356.59 hectare or 4.37 per cent of the city, and the smallest area is the inner fringe area with 320.88 hectare or 3.93 per cent of the city (Table 6.4). This model is divided into 3 parts: urban area, inner fringe, and outer fringe (Figure 6.3).

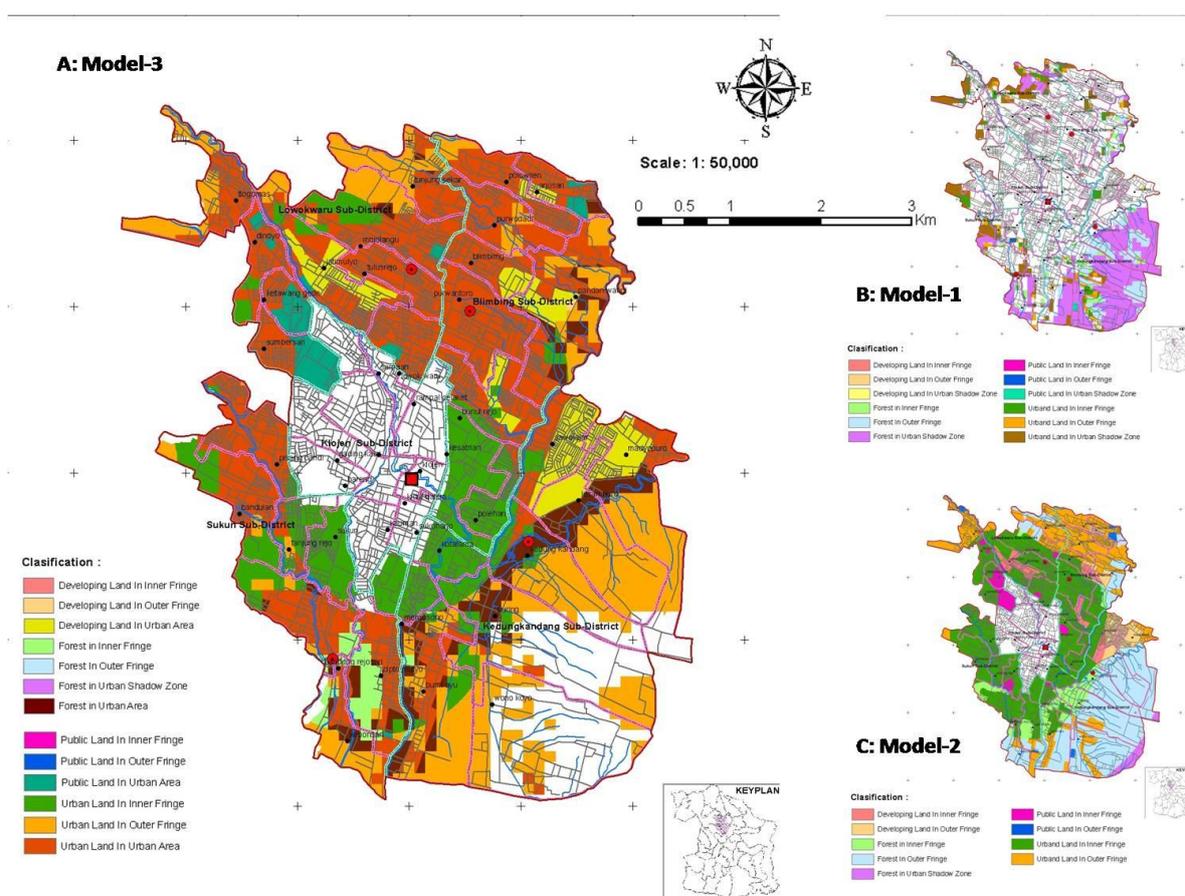
**Table 6.4** Percentage of rural-urban fringe area 2010 by comparison of three models

No.	Category of morphology	Area	
		(ha)	%
<b>COMBINATION MODEL</b>			
I	Urban area	5045.55	61.80
	Rural-urban fringe area		
II	1 Inner fringe	320.88	3.93
	2 Outer fringe	356.59	4.37
	Total of rural-urban fringe	677.47	8.30
	Total of the City	8164.33	100

**Table 6.5** The percentage of land-use types changes in rural-urban fringe area by three models

Model	Percentage of land-use type changes (%)											
	F			U			P			D		
	1990	2000	2010	1990	2000	2010	1990	2000	2010	1990	2000	2010
Combination model	58.8	37.1	13.4	35.4	53.6	76	4.8	8.1	10.2	1.1	1.3	0.5

Land-use type changes of combination model shown in Figure 6.7a and Table 6.5. Land-use type in combination model changed. Forest and farmland in combination model decreased. Urban-land and public-land increased. Furthermore, the total of rural-urban fringe area in combination model decreased.



**Figure 6.7** Land-use types changes in urban fringe area based on combination model (a), based on urban-rural land use model (b), and based on spatial structure model (c)

It should be underlined that an appropriate model should meet the following requirements:

- (5) The total area of rural-urban fringe should be decreased
- (6) Urban-land and public-land should be increased
- (7) Forest and farmland should be decreased
- (8) No changing domination area in connection with location of inner, outer and urban shadow zone

In urban-rural land use model (Figure 6.7b), total area of forest and farmland dropped from 57.16 to 39.94 per cent. The domination area is urban shadow zone. Urban-land and public-land increased in 2000 and that decreased in 2010. The domination area is changing between

inner fringe and outer fringe. It shows that this model is questionable (Figure 6.7b). It looks like sprawl.

In spatial structure model (Figure 6.7c), total area of forest and farmland decreased from 36.95 to 13.66 per cent. Urban land increased from 37.55 to 57.81 per cent (Figure 6.7c). In this model, the weakness is the total area of urban fringe is not changed. Furthermore, combination model is better than others. The domination area of forest and farmland in combination model is outer fringe. Then domination area of urban-land and public-land is inner fringe, no changing domination area in each land use types from 1990 to 2010 (Figure 6.7a).

To prove that combination model is better than two others model, we analysed land-use type changes related to location of rural-urban fringe area in detail. We choose Pandanwangi village in detail (Table 6.6).

Table 6.6 shows that combination model (model-3) is better than two others model. The weakness of urban-rural land use model (model-1) is the total area of urban-land in rural-urban fringe decrease. Furthermore, the weakness of spatial structure model (model-2) is the total area of rural-urban fringe is not changed in each period.

## 6.8. The Pattern of regional development

### 6.8.1. The Pattern of population growth

Table 6.7 shows that the average of population growth in the rural-urban fringe area of 5.68 per cent. The average of population growth in the rural-urban fringe is relatively high considering the average of population growth in the total of city 1.17 per cent. The area is growing more than the average growth of total population in the rural-urban fringe area is the inner fringe of 6.69 per cent per year. This is probably due to the inner fringe is the area directly adjacent to urban areas. While the rate of growth in the outer fringe, not too much different from the rate of growth in the total area.

**Table 6.7** The development of population in the rural-urban fringe area

Areas	1990	1995	2000	2005	2010	%
Inner fringe (IF)	9145	13540	18280	24320	28642	6.69
Outer fringe (OF)	7184	8046	9350	11380	15720	4.40
Total of rural-urban fringe (RUF)	16329	21586	27630	35700	44362	5.68

The average of come-in population growth in the study area is 1.03 per cent. The largest arrival rate of development is owned by the outer fringe area for 1.56 per cent, while the smallest arrival rate of development is owned by the inner fringe area of 0.98 per cent (Table 6.8).

**Table 6.8** The development of come-in population in the rural-urban fringe area

Areas	1990	1995	2000	2005	2010	%
Inner fringe (IF)	798	815	857	918	870	0.98
Outer fringe (OF)	856	898	930	980	1150	1.56
Total of rural-urban fringe (RUF)	1654	1713	1787	1898	2020	1.03

The total of farmer in the rural-urban fringe area is decline. From 8514 farmers in 1990 changed to 2890 farmers in the late 2010. It decreased around 4.30 per cent. In each of the classification of rural-urban fringe area, the inner fringe area of high decline in the population of farmers compared to the outer fringe area of 5.17 per cent (Table 6.9).

**Table 6.9** The development of farmer in the rural-urban fringe area

Areas	1990	1995	2000	2005	2010	%
Inner fringe (IF)	2594	2498	2380	1370	650	5.17
Outer fringe (OF)	5920	5720	5620	3460	2240	3.94
Total of rural-urban fringe (RUF)	8514	8218	8000	4830	2890	4.30

### 6.8.2. The Pattern of building

During the period from 1990 to 2010, the pattern formation of the building in the inner fringe and outer fringe areas is leapfrog development, where the physical development of the region spread sporadically throughout the region. Charging area is leaping because this area is easy to lose agricultural-land. These types of developments can be seen in all the villages included in the rural-urban fringe area (Figure 6.7a).

### 6.8.3. The Pattern of agricultural-land reduction

Table 6.10 shows that the pattern of agricultural-land reduction in the outer fringe for 20 years is 19.45 hectare per year. Then, the pattern of agricultural-land reduction in the inner fringe is the lowest (12.70 hectare per year).

**Table 6.10** Agricultural-land reduction in the rural-urban fringe area

Areas	Agricultural-land (ha)		Agricultural-land reduction (ha/year)
	1990	2010	
Inner fringe (IF)	285	31	12.70
Outer fringe (OF)	449	60	19.45
Total of rural-urban fringe (RUF)	734	91	32.15

### 6.8.4. The Pattern of additional of residential-land

Additional of residential-land patterns over a period of 20 years in the study area concentrated in inner fringe area of 25 hectare per year, and the lowest in the outer fringe area for 12 hectare per year (Table 6.11).

**Table 6.11** Additional of residential-land in the rural-urban fringe area

Areas	Residential-land (ha)		Additional of residential-land (ha/year)
	1990	2010	
Inner fringe (IF)	220	720	25.00
Outer fringe (OF)	180	420	12.00
Total of rural-urban fringe (RUF)	400	1140	37.00

**Table 6.6** Percentage of land-use types changes in Pandanwangi by three models for 1990, 2000 and 2010

Classification	Urban-rural land use model						Spatial structure model						Combination model					
	'90		'00		'10		'90		'00		'10		'90		'00		'10	
	F %	U %	F %	U %	F %	U %	F %	U %	F %	U %	F %	U %	F %	U %	F %	U %	F %	U %
IF	57	43	60	28	40	41	81	19	29	56	5	65	79	21	48	37	2	95
OF	65	34	74	19	51	39	61	39	50	41	36	55	68	32	63	36	33	66
USZ	0	17	33	21	52	48	0	0	0	0	0	0	0	0	0	0	0	0
UF	74	26	57	23	48	43	68	32	42	46	25	59	74	26	54	37	19	80
Total of UF	269.38		266.32		107.94		398.25		398.25		398.25		398.25		345.27		183.03	

### 6.8.5. The Pattern of additional of non-agriculture land and residential-land

Additional patterns of non-agriculture land and residential-land over a period of 20 years in the study area concentrated on the outer fringe area of 8.50 hectare per year, and the inner fringe area of 3.00 hectare per year (Table 6.12).

**Table 6.12** Additional of non-agriculture land and residential-land in the rural-urban fringe area

Areas	Non-agriculture land and residential-land (ha)		Additional of non-agriculture land and residential-land (ha/year)
	1990	2010	
Inner fringe (IF)	68	128	3.00
Outer fringe (OF)	220	390	8.50
Total of rural-urban fringe (RUF)	288	518	11.50

### 6.8.6. The Pattern of acceleration of urban sprawl

The highest acceleration in the period from 1990 to 2010 experienced by inner fringe area is 2.44. The lowest acceleration of urban sprawl experienced by outer fringe area is 3.08. The calculation of urban sprawl acceleration shows that the urban process in the inner fringe area is faster than the outer fringe (Table 6.13).

**Table 6.13** Acceleration of urban sprawl index

Areas	Agricultural-land (ha)		Agricultural-land reduction (ha/year)	Acceleration of urban sprawl index
	1990	2010		
Inner fringe (IF)	285	31	12.70	2.44
Outer fringe (OF)	449	60	19.45	3.08
Total of rural-urban fringe (RUF)	734	91	32.15	2.83

## 6.9. The Process of regional development

### 6.9.1. Housing acquisition

Changes by individuals in the outer fringe area influenced inheritance, whereas the inner fringe area changes by individuals in large numbers because of the many migrants and housing development (Table 6.14).

**Table 6.14** Housing acquisition in rural-urban fringe area

Areas	Housing acquisition						Total
	Buy so		Build their own		Use of land inheritance		
	person	%	person	%	person	%	
Inner fringe (IF)	26	32.10	40	49.38	15	18.52	81
Outer fringe (OF)	20	19.42	41	39.81	42	40.78	103
Total of rural-urban fringe (RUF)	46	51.52	81	89.19	57	59.30	184

### 6.9.2. Farmer's commitment to their agricultural-land

Land conversion from agricultural-land to non-agriculture land determined by farmer's commitment to their agricultural-land. High motivation of farmers to maintain agricultural-land, it will cause lowest conversion rate of agricultural-land in rural-urban fringe areas. Conversely, if the motivation of farmers is low, the conversion rate of agricultural-land will become easier.

**Table 6.15** Farmer's commitment to their agricultural-land

Areas	Commitment to agricultural-land				Total
	Yes		No		
	person	%	person	%	
Inner fringe (IF)	28	34.57	53	65.43	81
Outer fringe (OF)	58	56.31	45	43.69	103
Total of rural-urban fringe (RUF)	86	46.74	98	53.26	184

The majority of farmers in the inner fringe area do not want to keep their farm. While, many farmer in the outer fringe area who still wants to maintain their agricultural land in the amount of 56.31 per cent (Table 6.15).

**Table 6.16** Farmer's commitment to their agricultural-land\* income distribution of farmer

		How is your income distribution?			Total
		Occupational activity	Two occupational activity	More than two occupational activity	
Are you going to keep the function of your agricultural-land in 2010?	Yes	95	1		96
	No	10	65	13	88
Total		105	66	13	184

Cross-tabulation between farmer's commitment to their agricultural-land and income distribution of farmer can be seen in Table 6.16. It shows that the majority of farmers want to maintain their farm because they just have one occupational activity as farmer. In contrast, some farmer did not want to maintain their farm because they have two occupational activities and more than two. So, agricultural-land is not important for them.

### 6.9.3. Farmer's commitment to their agricultural-activities

Land conversion in the study areas influenced many things. One of them is the commitment of farmers to their agricultural activities. One of the impacts occur when farmers are not motivated to start their agricultural activities are farmers going to change the use of agricultural-land. They think that it is no longer perceived earning their living. When this happens, it will be easier to land conversion in the study areas.

Majority of farmers in the inner fringe area do not want to maintain their agricultural activities. While, many farmers in the outer fringe area who still wants to maintain their agricultural activities is 63 per cent (Table 6.17).

**Table 6.17** Farmer's commitment to their agricultural-activities

Areas	Commitment to agricultural-land				Total
	Yes		No		
	person	%	person	%	
Inner fringe (IF)	18	22.22	63	77.78	81
Outer fringe (OF)	65	63.11	38	36.90	103
Total of rural-urban fringe (RUF)	83	45.11	101	54.89	184

Cross-tabulation between farmer's commitment to their agricultural-activities and income distribution of farmer can be seen in Table 6.18. It shows that the majority of farmers want to maintain their job as farmer because they just have one occupational activity as farmer. In contrast, some farmer did not want to maintain their farm because they have two occupational activities and more than two. So, agricultural-land is not important for them.

**Table 6.18** Farmer's commitment to their agricultural-activities\* income distribution of farmer

		How is your income distribution?			Total
		Occupational activity	Two occupational activity	More than two occupational activity	
Are you going to maintain your job as a farmer in 2010?	Yes	99	1		100
	No	6	65	13	84
Total		105	66	13	184

### 6.10 Recapitulation of characteristic changes in the rural-urban fringe area

The detail of recapitulation of characteristic changes in the rural-urban fringe area can be seen in the Table 6.19.

**Table 6.19** Recapitulation of characteristic changes in the rural-urban fringe area

No.	Indicators	Changes	Causative Factor
1	Population growth	Population growth in the rural-urban fringe area is higher (5.38%) considering the average of population growth in the total of the city is only of 1.17. Inner fringe is 6.69%.	This is probably due to the inner fringe is the area directly adjacent to urban areas.
2	Come-in population	The largest arrival rate of development is owned by the outer fringe area for 1.56 %	A large area and fringe-settlements were built in the outer fringe area.
3	Farmer population	The total of farmer in the rural-urban fringe area is decline.	Agricultural-land conversion because of fringe-settlements
4	Agricultural-land reduction	The biggest agricultural-land reduction in the outer fringe for 20 years is 19.45 ha/year.	There is no other option for farmer than selling their agricultural-land to developers
5	Additional of residential-land	It concentrated in the inner fringe area of 25 ha/year	This is probably due to the inner fringe is the area directly adjacent to urban areas.
6	Additional of non-agriculture land and residential-land	It concentrated on the outer fringe area of 8.50 ha/year	Still have a large area with a good environment
7	Acceleration urban sprawl	The calculation of urban sprawl acceleration shows that the urban process in the inner fringe area is faster than the outer fringe	Additional of residential-land concentrated in the inner fringe and also the centre of urban area
8	Housing acquisition	The inner fringe area changes by individuals in large numbers	Because of the many migrants and housing development
9	Farmer's commitment to agricultural-land	The majority of farmers in the inner fringe area do not want to keep their farm. While, many farmer in the outer fringe area who still wants to maintain their agricultural land in the amount of 56%	<b>High motivation</b> of farmers to maintain agricultural-land will cause lowest conversion rate of agricultural-land in the rural-urban fringe area.
10	Farmer's commitment to agricultural activities	The majority of farmers in the inner fringe area do not want to maintain their agricultural activities. While, many farmers in the outer fringe area who still wants to maintain their agricultural activities in the amount of 63%	The majority of farmers want to maintain their job as farmer because they just have one <b>occupational activity</b> as farmer.

### 6.11. Strategy of rural-urban fringe area

The diagram of SWOT shows that the location of development of rural-urban fringe areas in quadrant II and the space D with "Selective Maintenance Strategy": development strategy that is urban development strategy with emphasis on the things that considered importantly (Figure 6.8).

Based on the results of the SWOT matrix (Table 6.20) that have done, then the concept resulting from the combination of each element of the SWOT sought implementation strategy. Strategy on a combination of each element of the SWOT can be seen in the description below:

- (1) S-O concepts (Strength-Opportunity): "Utilization of agricultural lands in rural-urban fringe areas as food providers at the same time balancing the ecological city to support the provision of food in the study area".
- (2) S-T concepts (Strength-Threat): "Development of the study area should be consider which land can be converted into built-up", and "The existence of the agricultural areas in accordance with the City Plan maintained and controlled as reserve-land development through the means of prevention of land conversion.
- (3) W-O concepts (Weakness-Opportunity): "Improved quality control mechanism for conversion of agricultural land, especially in the rural-urban fringe to keep the existence of agricultural-land in the study area".
- (4) W-T concepts (Weakness-Threat): "Need for 'Local Regulation' in the imposition of sanctions for perpetrators of violations of land conversion".

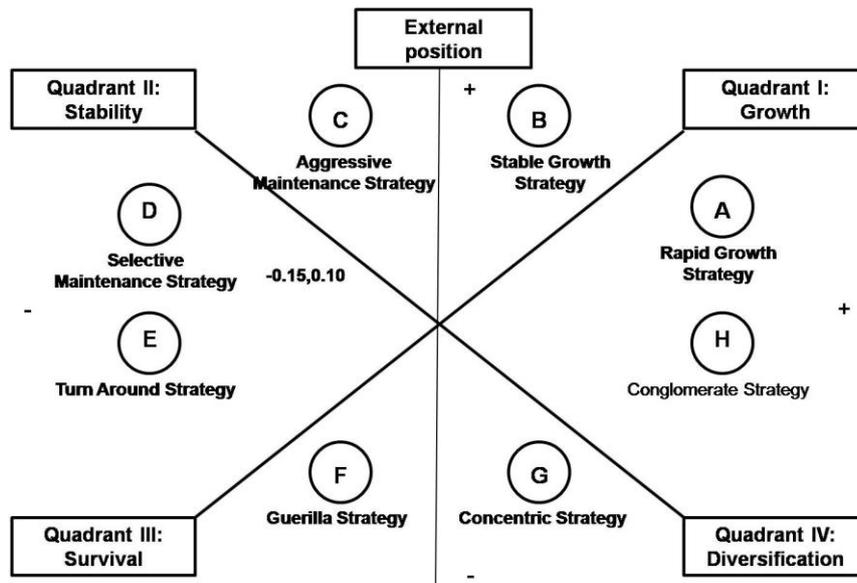


Figure 6.8 SWOT diagram

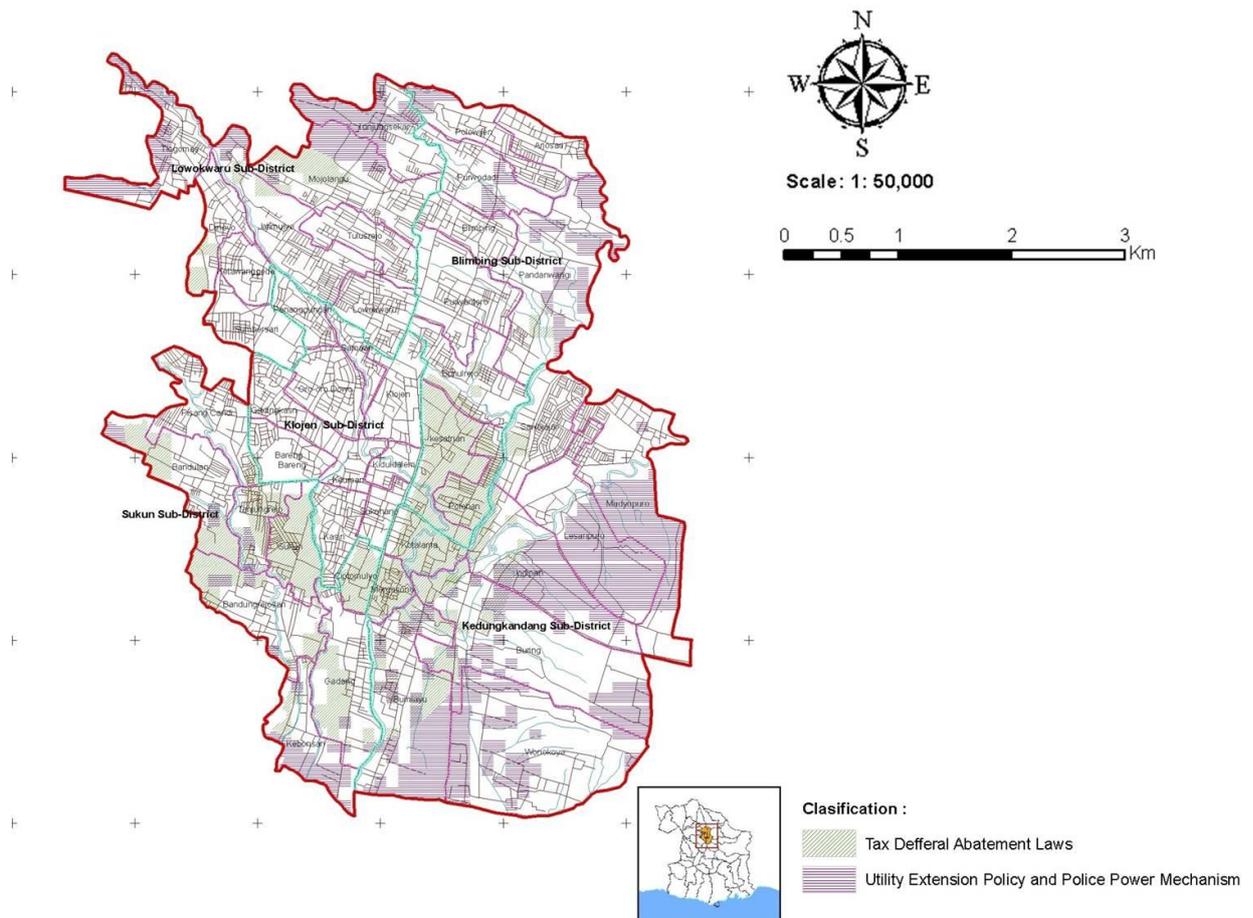


Figure 6.9 Appropriate concepts for rural-urban fringe area

An appropriate concept for the inner fringe area and the outer fringe area can be seen in Figure 6.9. Tax Defferal and Abatement Laws is suitable to be applied to the inner fringe area because the majority of the population in no longer committed to preserve agricultural land and agricultural-activities. Utility Extension Policy and Police Power Mechanism is suitable to be applied to the outer fringe area because the availability of agricultural land is still a lot and the farmers are still committed to agricultural land and agricultural activities.

### 6.11. Conclusion

The patterns of regional development in the rural-urban fringe area characterized the following circumstances:

- (1) The average of population growth in rural-urban fringe areas is higher (5.38 per cent) considering the average of population growth in the total of the city is only of 1.17 per cent. The area is growing more than the average growth of total population in the rural-urban fringe area is the inner fringe of 6.69 per cent per year. This is probably due to the inner fringe is the area directly adjacent to urban areas.
- (2) From 1990 to 2010, the pattern of building in rural-urban fringe area is leapfrog, where the physical development of areas spread sporadically throughout the region. Charging area leaping because this area is easy to lose agricultural-land.
- (3) The pattern of reduction in agricultural-land over the next 20 years in the study area concentrated in outer fringe area of 19.45 hectare per year.
- (4) The pattern of additional of non-agriculture land and residential-land over the next 20 years in the study area concentrated in outer fringe area of 8.50 hectare per year.
- (5) The pattern of additional of residential-land during the period of 20 years in the study area concentrated on the inner fringe area that is equal to 25 hectare per year.
- (6) The highest acceleration in the period from 1990 to 2010 experienced by inner fringe area of 2.44. The lowest of urban sprawl acceleration experienced by the outer fringe area of 3.08. The calculation of urban sprawl acceleration shows that the urban process in the inner fringe area is faster than the outer fringe.

Regional development process characterized by the following facts:

- (1) Changes by individuals in the inner fringe and the outer fringe affected fringe-settlements development in the region.
- (2) The majority of farmers in the inner fringe area do not want to keep their farm. While, many farmers in the outer fringe area who still wants to maintain their agricultural-land in the amount of 56.31 per cent.
- (3) The majority of farmers in the inner fringe area do not want to maintain their agricultural activities. While, many farmers in the outer fringe area who still want to maintain their agricultural activities in the amount of 63.11 per cent.

The strategy can be proposed are as follows:

- (1) Utilization of agricultural lands in the rural-urban fringe area as food providers at the same time balancing the ecological city to support the provision of food in the study area.
- (2) Development of the study area should be consider which land can be converted into built-up, and the existence of the agricultural area in accordance with the City Plan maintained and controlled as reserve-land development through the means of prevention of land conversion.
- (3) Improved quality control mechanism for conversion of agricultural land, especially in the rural-urban fringe to keep the existence of agricultural-land in the study area.

- (4) Need for 'Local Regulation' in the imposition of sanctions for perpetrators of violations of land conversion.

The concept can be proposed are as follows:

- (1) An appropriate concept for the inner fringe area is Tax Defferal and Abatement Laws. Applying a tax on those areas of land on the basis of 'use value' despite having a high sale, as long as the owner retains the form of land use (agriculture), this concept can be done. This concept is suitable to be applied to the inner fringe area because the majority of the population in no longer committed to preserve agricultural land and agricultural-activities.
- (2) An appropriate concept for the outer fringe area is Utility Extension Policy and Police Power Mechanism. This concept is suitable to be applied to the outer fringe area because the availability of agricultural land is still a lot and the farmers are still committed to agricultural land and agricultural activities.

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**Table 6.20** SWOT matrix of rural-urban fringe area in study area

	S	W
	<p>Total of rural-urban fringe area is 677.47 ha or 8.30% of the total area of the city which allows to control the development of the city.</p> <p>56.31% of farmers in the outer fringe area still want to maintain their farm.</p> <p>63.11% of farmers in the outer fringe area still want to maintain their agricultural activities.</p> <p>Some village in the rural-urban fringe area in City Plan of the study area defined as the center of development:</p> <ul style="list-style-type: none"> <li>▪ Buring and Bandulan directed as BWK development center.</li> <li>▪ Some of the village directed as the area of settlements development.</li> <li>▪ Tunjungsekar, Buring, and Lesanpuro directed as the area of education development in the regional scale.</li> </ul> <p>Agriculture areas kept in the study area is according City Plan of suburb around Tunjungsekar and some of Buring.</p> <p>The study area has a means of prevention of land conversion through City Plan products, giving 'Land Development Permits' (IMB) by the Office of Licensing, and land conversion mechanism.</p>	<p>Agricultural-land decreased by 32.15 ha/year is possible cause a decrease of green open space and environmental quality.</p> <p>The development of population is highest, where the average of population growth in rural-urban fringe areas (5.68%) exceeds the average of population growth in the city (1.17%).</p> <p>Acceleration of urban sprawl in the inner fringe is highest.</p> <p>The pattern of building development is leapfrog in the rural-urban fringe area of this region causes the most rapid loss of open land. So, it should be a concern in its control.</p> <p>The majority of farmers in the inner fringe area do not want to maintain the agricultural-land and agricultural-activities. So if we want to control the land in the region experiencing constraints.</p> <p>Environmental carrying capacity decreased due to further reduction in area of open space that are common in rural-urban fringe areas and one of them is agricultural land from the city.</p>
<b>O</b>	<p>The presence of agricultural-land in the study area can reduce the burden of food provision in East Java Province.</p> <p>Revision City Plan in the East Java: The study area became the center for regional development.</p>	<p>Utilization of agricultural lands in rural-urban fringe areas as food providers and the balance of ecological city to support the provision of food in the study area.</p> <p>Improved quality control mechanism for conversion of agricultural-land, especially in rural-urban fringe area to keep the existence of agricultural-land in the study area.</p>
<b>T</b>	<p>So many investors who had invested their capital through the acquisition of land in large numbers, especially in Kedungkandang sub-district but not yet implemented, so that sometimes can occur over land use.</p> <p>So many land-speculators like to make land conversion transaction directly without the correct mechanism.</p>	<p>Development of the study area should consider land which could be converted into built-up.</p> <p>The existence of agriculture areas in accordance with the City Plan maintained and controlled as reserve land development through the means of prevention of land conversion.</p> <p>Local Regulation in the imposition of sanctions for perpetrators of violations of land conversion is necessary.</p>

Source: Analysi

## **CHAPTER 7**

### **CONCLUSIONS AND SUGGESTIONS**

#### **7.1 Conclusions**

The main purpose of this research is to improve the policy of rural-urban planning related to urban development in the rural-urban fringe area. Thus, this research questions are manifested into three aims of research, namely: to examine the location of rural-urban fringe area based on combination model, to identify the physical change of rural-urban fringe area, to identify the characteristics change of rural-urban fringe area, and to examine an appropriate strategy to anticipate urban development in the rural-urban fringe area.

##### **7.1.1 Location of rural-urban fringe area**

This research is concerned with land use between urban, rural, and how to find an appropriate model to identify the location of the rural-urban fringe area. Land use as a human activity product on earth's surface shows a large variation, within both local and regional city. An understanding of land use forms that characterize the built-up area, urban-rural transition area, and the countryside itself, is a matter of principle to do its spatial structure differentiation.

The rural-urban fringe area is the most important area in the city because if city center is insufficient for urban population, the target of urban development will move to the rural-urban fringe area. In fact, it is difficult to trace boundaries of rural-urban fringe area clearly because of the mixing of urban and provincial properties in an area once. This research investigates this problem by comparing result and interpretation of three models with the same data using GIS function. Identification of rural-urban fringe area in each model is different.

The results show that there are differences large amounts of rural-urban fringe areas in three models. The location of inner, outer, and urban shadow zone on each model is different. The location of inner, outer and urban shadow zone in urban-rural land use model tends to be spread throughout the region. We can find the location of the urban shadow zone close to the city center. In contrast, some parts of the inner fringe are located far from city center, close to the rural areas. It is often questionable. In addition, the urban-rural land use model has a weakness: urban-land in rural-urban fringe area is unstable. Furthermore, the spatial structure model determines rural-urban fringe area location based on the distance to the city center. We all know that each city in the world has a different radius and, therefore, we must determine the distance of rural-urban fringe area to the city center according to the radius of each city. This model is idealistic. On the other hand, the weakness of the spatial structure model is the total area of rural-urban fringe does not change in each period.

The combination model is an appropriate model to identify rural-urban fringe area location compared with the other two models because the rural-urban fringe area location (inner and outer fringe) is more balanced and reasonable than the other two models. The combination model can meet the four requirements related to identification of rural-urban fringe area location. The authors hope that this study will give a new model that can be used by planners to identify rural-urban fringe area location. It is important for rural-urban planning if we want

to make an appropriate concept and strategy to anticipate urban developments in the rural-urban fringe area.

### **7.1.2 Physical changes of rural-urban fringe area**

This research is related to the physical change in the rural-urban fringe area, the development of fringe settlements, and the pattern of development of the region of space around the fringe-settlements. Fringe-settlements are located in the rural-urban fringe area and it was built by housing-developers.

Many urban populations prefer to live in the rural-urban fringe area, as well as housing developers to build housing there due to high demand. This is caused by several things, such as land is cheaper, there is less traffic congestion and pollution, there is easier access and a better road infrastructure, and there is a more pleasant environment with more open space. Many developers are competing with construction in the rural urban fringe areas because they want to use the land in the region for several purposes, such as housing developments as urban sprawl continue, science and business parks, hyper-markets and superstores, office developments, hotels and conference centers.

If urban development in the area of rural-urban fringe continues to be left uncontrolled, it would be dangerous for the survival of rural-urban fringe area. Because it will cause some problems in the rural-urban fringe area such as large area of the rural-urban fringe maybe lost, buildings maybe out of character with existing rural buildings, villages become sub urbanized, traffic is likely to increase, there may be some noise or pollution. Thus, the objective of this research is to improve the policy of fringe-settlements development in the rural-urban fringe area.

Physical changes occur in the rural-urban fringe area due to the existence of 'fringe-settlements', among others:

- There was a significant change in land use from paddy fields into settlements
- Building area changes becoming increasingly 'wide building' because respondent adds their house to be used as a place of business.
- Function of the building changed, which was originally 'residential' become home-business.
- Changes in conditions of neighborhood road previously the dirt road/rocks into the asphalt road.
- Demand for electricity changed, from 450 VA to 900 VA and 450 VA & 900 VA to 1300 VA. Due to changes in house-building functions into the business so that demand for electricity increases.
- There is a change shape of the building to be better. With home-business, people get additional income, which is used to renovate the 'shape of their building'.
- There is a change layout of the buildings to be not good-layout, because many home-business that are located too close to one another thereby affecting the air temperature and environmental health.
- There is a change for the bad-waste service, it is due to systematic waste services have not been going well especially the inadequate number of officers, and the waste hauler has not been precisely the time of transport. Meanwhile, the amount of waste increases progressively with increasing resident and the layout of the building is not-good. This affects the waste service into a bad system.

- Source of water changed, which originally is still a lot to get water from the river is now sourced from PDAM and wells.

As a result of the influence of the development of 'fringe-settlements' occurred-specific patterns in the rural-urban fringe areas, namely:

- The pattern of land-use change is star-shaped pattern. This is influenced by transportation routes (roads) and transportation facilities.
- The pattern of 'distribution facilities' (home-business) is a scattered constellation. This is influenced by the distance to the 'fringe-settlements', the travel time, transportation facilities and land values.
- The distribution pattern of other commercial facilities (cafe, copy, store, diner) is a ribbon/linear. It is influenced by the transportation routes (roads) and distance to the 'fringe-settlements'.
- The pattern of neighborhood road is angled or grid system. This is influenced by lots of buildings, land use and building function.
- The pattern of growth of the building is vertical. This is influenced by the value of land and limited horizontal space.
- The pattern 'layout of buildings' on the road is linear for commercial buildings (food stalls, shops, cafes, etc.). This is influenced by transportation routes (roads) and distance to the 'fringe-settlements' as a center of activity and proximity to settlements.
- The pattern of layout of the buildings (home-business) of other buildings concentrated and elongated. Concentrated pattern is influenced by lots of buildings and the location of the previous building that has been established. The pattern of elongate is influenced by transportation routes (roads).

For the establishment of new fringe-settlements should be established in areas that still have a large area especially in inner fringe, and that is not the area of agriculture. This is because the existence of the fringe-settlements will influence the development of rural-urban fringe area. If the fringe settlements built in the agricultural area especially in outer fringe, it would have caused many problems especially in terms of land use. Outer fringe area should be keep for agricultural-land. So, there is a balance in the rural urban fringe area between inner fringe and outer fringe.

In fact, the development of 'fringe-settlements' gives considerable influence on the physical changes and the social-cultural in the rural-urban fringe area. This proves that the 'fringe-settlement' is the trigger new growth of a city/region. For that reason, there needs to be regulation of the 'fringe-settlements' and home-business especially in Indonesia to being focused and organized.

### **7.1.3 An appropriate strategy for rural-urban fringe area**

This research is concerned with the characteristic of urban development in rural-urban fringe area and how to measure an appropriate strategy for rural-urban fringe area. The main purpose of this research is to improve the policy of rural-urban planning related to urban development in rural-urban fringe area.

The patterns of regional development in rural-urban fringe area characterized the following circumstances:

- (1) The average of population growth in rural-urban fringe areas is higher (5.38 per cent) considering the average of population growth in the total of the city is only of 1.17 per

cent. The area is growing more than the average growth of total population in the rural-urban fringe areas is the inner fringe of 6.69 per cent per year. This is probably due to the inner fringe is the area directly adjacent to urban areas.

- (2) From 1990 to 2010, the pattern of building in rural-urban fringe area is leapfrog, where the physical development of areas spread sporadically throughout the region. Charging area leaping because this area is easy to lose agricultural-land.
- (3) The pattern of reduction in agricultural-land over the next 20 years in the study area concentrated in outer fringe area of 19.45 hectare per year.
- (4) The pattern of additional of non-agriculture land and residential-land over the next 20 years in the study area concentrated in outer fringe area of 8.50 hectare per year.
- (5) The pattern of additional of residential-land during the period of 20 years in the study area concentrated on the inner fringe area that is equal to 25 hectare per year.
- (6) The highest acceleration in the period from 1990 to 2010 experienced by inner fringe area of 2.44. Acceleration of urban sprawl the lowest experienced by outer fringe area of 3.08. The calculation of urban sprawl acceleration shows that the urban process in the inner fringe area is faster than the outer fringe.

Regional development process characterised by the following facts:

- (4) Changes by individuals in inner fringe and outer fringe affected the housing development in the region.
  - (1) The majority of farmers in inner fringe areas do not want to keep their farm. While, many farmers in outer fringe area who still wants to maintain their agricultural-land in the amount of 56.31 per cent.
  - (2) The majority of farmers in inner fringe areas do not want to maintain their agricultural activities. While, in the outer fringe areas are still many farmers who still want to maintain their agricultural activities in the amount of 63.11 per cent.

The strategy can be proposed are as follows:

- (1) Utilization of agricultural lands in rural-urban fringe areas as food providers at the same time balancing the ecological city to support the provision of food in the study area.
- (2) Development of the study area should be consider which land can be converted into built-up, and The existence of the agricultural areas in accordance with the City Plan maintained and controlled as reserve-land development through the means of prevention of land conversion.
- (3) Improved quality control mechanism for conversion of agricultural land, especially in the rural-urban fringe to keep the existence of agricultural-land in the study area.
- (4) Need for 'Local Regulation' in the imposition of sanctions for perpetrators of violations of land conversion.

The concept can be proposed are as follows:

- (1) An appropriate concept for the inner fringe area is Tax Defferal and Abatement Laws. Applying a tax on those areas of land on the basis of 'use value' despite having a high sale, as long as the owner retains the form of land use (agriculture), this concept can be done. This concept is suitable to be applied to the inner fringe area because the majority of the population in no longer committed to preserve agricultural land and agricultural-activities.
- (2) An appropriate concept for the outer fringe area is Utility Extension Policy and Police Power Mechanism. This concept is suitable to be applied to the outer fringe area because the availability of agricultural land is still a lot and the farmers are still committed to agricultural land and agricultural activities.

## **7.2 Suggestions**

The study of rural-urban fringe area location in developing countries is still rarely, this study provides a basis for future research, such as an detail study of identify location of rural-urban fringe area with a different size of grid cells and a different radius of the city because the rural-urban fringe area is important area for the city. So, there is clearly a need to continue this research to improve the arrangement of the city planning to be better.

## PUBLICATION LIST

### Peer-reviewed journal paper

- 1 Imma Widyawati Agustin, Hisashi Kubota (2012) An Appropriate Strategy to Anticipate Fringe-Settlements Development in the Rural-Urban Fringe Area, *Journal of Basic and Applied Scientific Research (JBASR)*, Textroad Journals Publications, Vol. 2 (10), pp. 10612-10619, 2012, ISSN 2090-4304, Part V. [http://www.textroad.com/JBASR-October,%202012\(5\).html](http://www.textroad.com/JBASR-October,%202012(5).html)
- 2 Imma Widyawati Agustin, Hisashi Kubota (2012) Conflict of Location in the Rural-Urban Fringe Area, *Journal of Basic and Applied Scientific Research (JBASR)*, Textroad Journals Publications, Vol. 2 (11), pp. 11910-11916, 2012, ISSN 2090-4304, Part V. [http://www.textroad.com/JBASR-November,%202012\(5\).html](http://www.textroad.com/JBASR-November,%202012(5).html)
- 3 Imma Widyawati Agustin, Hisashi Kubota (2012) Changing Physic, Changing Pattern, and Conflicts of Rural-Urban Fringe Using Combination Model, *Journal of Basic and Applied Scientific Research (JBASR)*, Textroad Journals Publications, Vol. 2 (12), pp. 12722-12730, 2012, ISSN 2090-4304, Part IV. [http://www.textroad.com/JBASR-December,%202012\(4\).html](http://www.textroad.com/JBASR-December,%202012(4).html)
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- 5 Imma Widyawati Agustin, Eddi Basuki Kurniawan, Hisashi Kubota (2013) The Possibility of BRO Works in the City of Malang: an Idea and an Analysis (Part-1), *Journal of Applied Environmental and Biological Sciences (JAEBS)*, Textroad Journals Publications, Vol. 2 (1), pp. 64-71, 2013, ISSN 2090-4215. <http://www.textroad.com/JAEBS-January,%202013.html>
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- 7 Imma Widyawati Agustin, Hisashi Kubota (2013) Contribution of BRO Toward Livable Cities, *Journal of Applied Environmental and Biological Sciences (JAEBS)* — accepted (it will be publish online in the middle of August 2013)
- 8 Imma Widyawati Agustin, Hisashi Kubota (2013) The Role of Land Use in Creating a Successful Place Function in the City Centre of Malang City (Case Study: Semeru Area and Tugu Area), *Journal of Advances in Natural and Applied Sciences (ANAS)* — in-review
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- 10 Imma Widyawati Agustin, Hisashi Kubota (2013) Pedestrian Safety in the City Centre of Malang City, *Journal of Applied Sciences Research (JASR, Jordan)* — in-review

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1 Agustin, I.W., Kubota, H. (2010) A New Combination Model to Identify Location of Urban Fringe Area, Proceedings of Sustain 2010, Kyoto, 11-12 December, pp. 170-182, Japan.

2 Imma Widyawati Agustin, Hisashi Kubota (2013) The Possibility of BRO Works in the City of Malang (Part-2), Proceedings of PLANINK International Conference 2013, Indonesia, 04-05 March, II-48, UB Press Publications.

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**Others**

1 Imma Widyawati Agustin, Hisashi Kubota (2012) Strategy yang Tepat untuk Mengantisipasi Perkembangan Fringe-Settlements di Kawasan Rural-Urban Fringe Area Berdasarkan Combination Model, Proceedings of Green Urban Housing Policy 2012, National Conference, Semarang City, 25 October, pp. 134-145, 2012, ISBN 978-602-98898-7-1, PLANOLOGI UNDIP Publications, Indonesia.

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<http://www.indo-planning-journals.com>

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Name and Signature/Seal: IMMA WIDYAWATI AGUSTIN





