

Conflicts of Location in the Rural-Urban Fringe Area

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ABSTRACT

This study examines rural-urban fringe area location based on urban-rural land use model and spatial structure model. It focuses on conflicts of location in the rural-urban fringe area. It is difficult to trace boundaries of the rural-urban fringe area clearly because of the mixing of urban and provincial properties in an area once. This study investigates this problem by comparing result and interpretation of two models with the same data using GIS function. This study reveals a weakness of urban-rural land use model: (1) the location of inner, outer and urban shadow zone tends to be spread throughout the region; (2) 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, and it closed to the rural area. It is often questionable; (3) urban-land in the rural-urban fringe area is unstable. The weakness of spatial structure model is the total area of rural-urban fringe does not change in each period. This model is idealistic.

Keywords: location, rural-urban fringe, GIS.

INTRODUCTION

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 [1]. Pryor [2] suggested four sub-zones in the 'regional city': (a) urban area, (b) urban fringe, (c) rural fringe, and (d) 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 [2]. Yunus [3] adds new sub-zones in sub-zone differentiation according to Pryor. They are located between the urban fringe and rural fringe: (a) urban areas; (b) urban fringe; (c) urban-rural fringe; (d) rural fringe, and (e) 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 [4]. Russwurm and Bryant [5] suggested three sub-zones: (a) inner fringe; (b) outer fringe, and (c) urban shadow zone.

This structure, based partly on Russwurm and Bryant [5], is particularly helpful, since it stresses the notion of a continuum between urban area and rural hinterland. 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. Hasyim [6] analyses urban land use change using temporal multispectral imagery and image

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difference by GIS. Remote sensing is the science or art to obtain information about the object, area or a symptom, by way of analyzing the data obtained by using the tool, without direct contact with the object, area or phenomenon to be studied [6,7,8]. It is a little different with this research.

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 [9].

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 populations 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 centres.

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. In fact, it is difficult to trace boundaries of the 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 two models using GIS function. Thus, the objective of this research is to improve the policy of fringe-settlements development in the rural-urban fringe area. Firstly, we identify the location of rural-urban fringe area based on urban-rural land use model. Secondly, we identify the location of rural-urban fringe area based on spatial structure model. Thirdly, we examine the weaknesses of two models related to rural-urban fringe area location. Thus, the outcome can be used as input for the city government in creating new model related to identify the location of rural-urban fringe area.

MATERIALS AND METHODS

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 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 (Fig. 1). 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 1. The percentage of land-use types in each period obtained by overlaying land-use and grid data. 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.

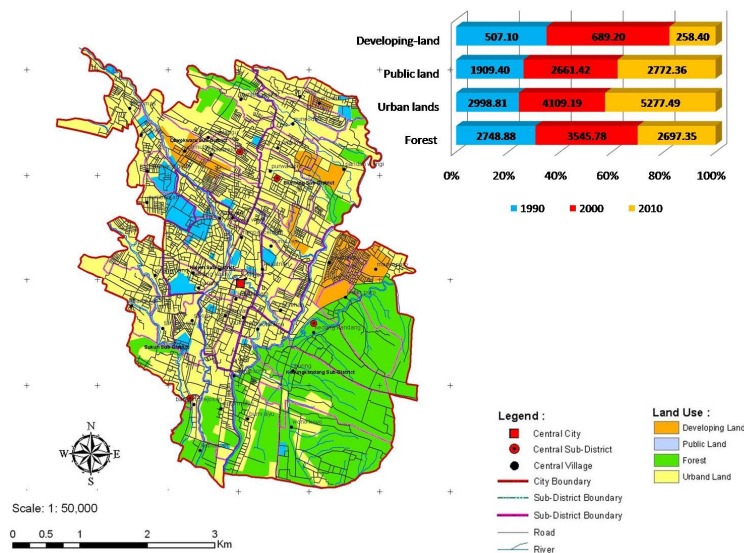


Fig. 1 Land-use types

Table 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 urban-rural land-use model to identify rural-urban fringe area location. This model adds new sub-zones in sub-zone differentiation according to Pryor [2]. They are located between the urban fringe and rural fringe: (a) urban areas; (b) urban fringe; (c) urban-rural fringe; (d) rural fringe, and (e) 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 [4]. 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 (Fig. 2).

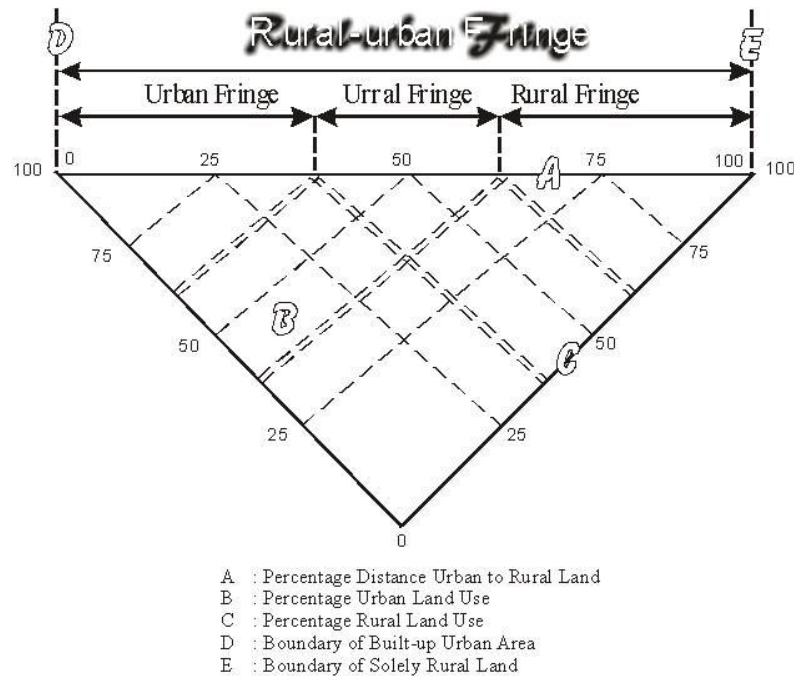


Fig. 2 Urban-rural land use model [3]

This research also used spatial structure model to identify rural-urban fringe location. This model suggests three sub-zones: (a) inner fringe; (b) outer fringe, and (c) urban shadow 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 [5]. It is shown in Fig. 3.

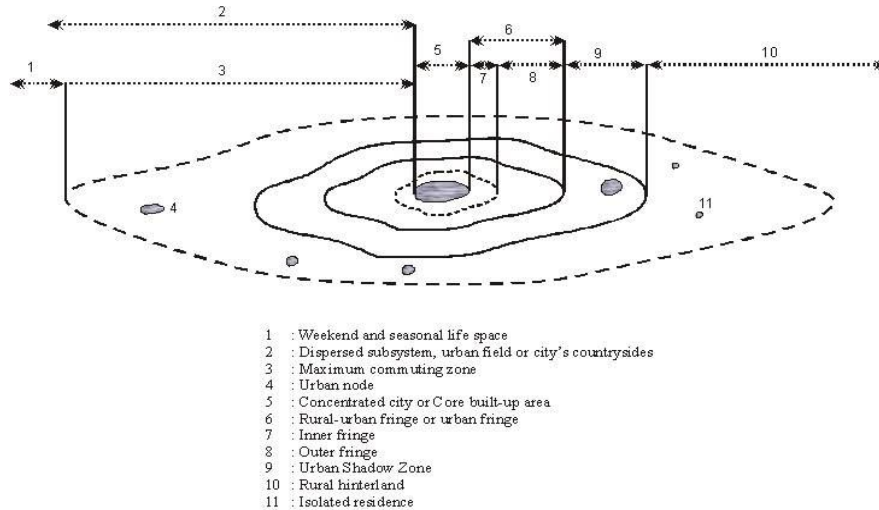


Fig. 3 Spatial structure model [5]

The location of the study is the rural-urban fringe in the city of Malang, Indonesia. The present study selected four sub-districts and 23 villages, which have a total area of about 8164.33 hectare. In 2010, there were 816,637 inhabitants (Statistic of Malang City, 2010). The study area located between 112.06° to 112.07° (East longitude) and 7.06°- 8.02° (South latitude). The study area has a topography that is most flat (96.3%) with slope 0 per cent to 15 per cent and a height of 380 meters to 667 meters above sea level (Fig. 4).

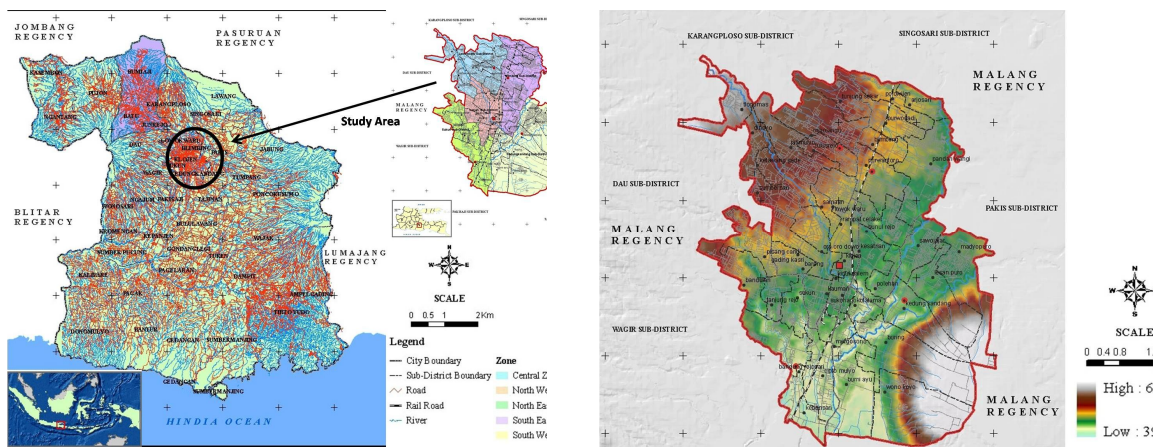


Fig. 4 The location of the study area and Digital elevation model of the study area

RESULTS AND DISCUSSION

The total of the rural-urban fringe area 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 2).

The location of inner fringe, outer fringe, and urban shadow zone in urban-rural land use model tends to be spread throughout the region (Fig. 5). We can find the location of the urban shadow zone close to the city centre. In contrast, some parts of the inner fringe are located far from the city centre, close to rural areas. It is questionable.

Table 2 Identification of rural-urban fringe area based on urban-rural land use model

No.	Category of morphology		Area	
			(ha)	%
URBAN-RURAL LAND USE MODEL				
I	Urban area		5429.53	66.50
II	Rural-urban fringe area			
	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

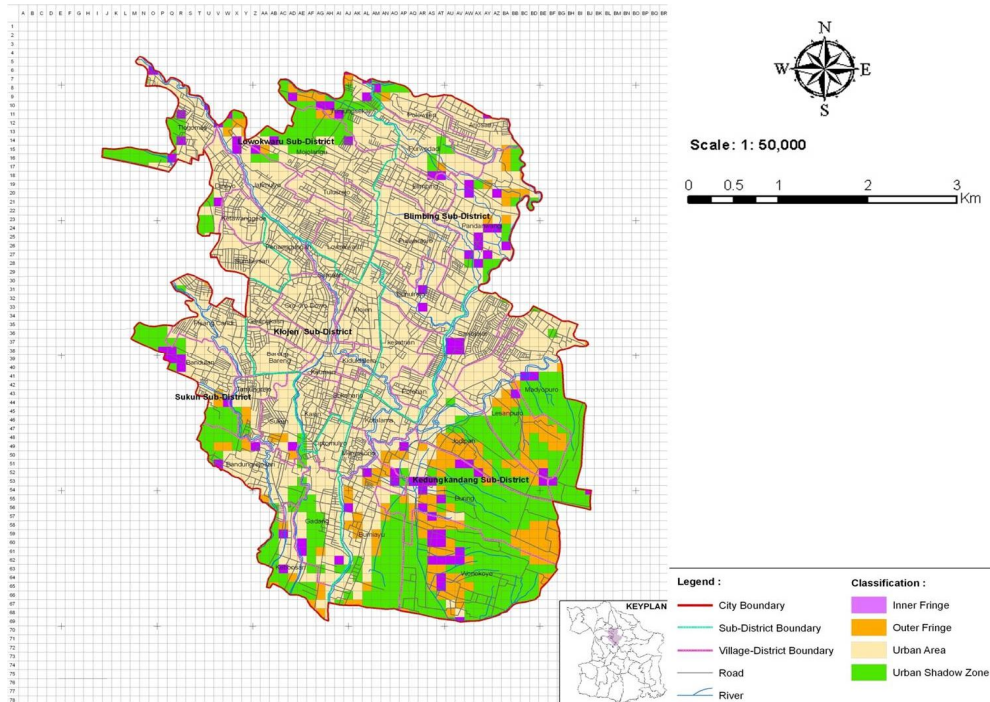


Fig. 5 Rural-urban fringe area based on urban-rural land use model

In contrast, the total of 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. 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 3). In this model, the total of rural-urban fringe area does not change in each period (Fig. 6).

Table 3 Identification of rural-urban fringe area based on spatial structure model

No.	Category of morphology		Area	
			(ha)	%
SPATIAL STRUCTURE MODEL				
I	Built-up area		882.50	10.81
II	Rural-urban fringe area			
	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

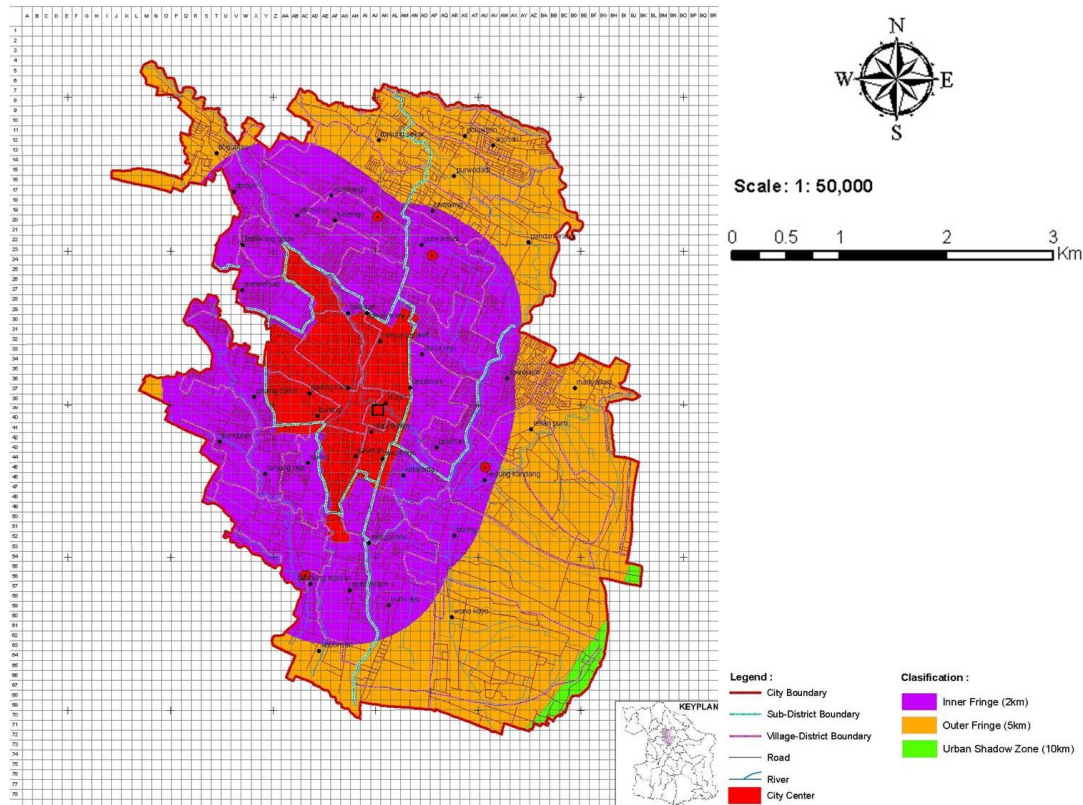


Fig. 6 Rural-urban fringe area based on spatial structure model

CONCLUSIONS

There are differences large amounts of rural-urban fringe areas in the two models. The location of inner fringe, outer fringe, and urban shadow zone on each model is different. The location of inner fringe, outer fringe, 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 centre. In contrast, some parts of the inner fringe are located far from city centre, close to the rural area. It is often questionable. In addition, the urban-rural land use model has a weakness: urban-land in the rural-urban fringe area is unstable. Furthermore, the spatial structure model determines the rural-urban fringe area location based on the distance to the city centre. We all know that each city in the world has a different radius and, therefore, we must to determine the distance of rural-urban fringe area to the city centre 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 authors hope that this study will give a new idea that can be used by other researchers to identify rural-urban fringe area location with an appropriate model. 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.

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