LAND USE AND SPATIAL PLANNING IN THE BOUNDARY'S DISTRICT/CITY

(Case study in Bogor Depok Tangerang and Bekasi)

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Abstract

RTRW is one of the policies that must be developed and implemented by the local government. Un-conformity often occurs between the spatial planning (RTRW) of a territory and the adjacent territory on the same land use. It shows the direction of regional planning. Bogor Depok Tangerang and Bekasi (Bodetabek) area is a hinterland of Jakarta that has a varying dynamics of regional development. This research will identify the phenomenon of land use and spatial plan on the boundary of Bodetabek region. The data used are spatial planning maps and land use maps from the National Land Agency (BPN). This BPN map is use to see land use in more detail. The analysis used in this study are GIS analysis and tabulation. Based on the analysis result, the boundary area in Bodetabek has some land use, including mixed garden, settlement, moor, rice field, industry, and so on. As many as 20 similar land use are identified in two adjacent districts. Most of the same land use on the border between Bogor and Bekasi districs. As much as 31% of planned RTRW on the same land use is conform between the two adjacent districts and 5% is un-conform area. Furthermore, the pattern of relationship between land use and RTRW can be known (exploitative or conservative planning). In addition, standardization of nomenclature used in the RTRW document should be done.

Keywords
Land use; spatial planning; conformity; boundary; Bodetabek

1. Introduction

Land use is a representation of the area. According Okeke, D (2015), land is the integrated part of space that is defined as ' …delineable area of the earth's terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface including those of the near-surface climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes, and swamps), the near-surface sedimentary layers and associated groundwater reserve, the plant and animal populations, the human settlement

pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings, etc).

Areas with dominant settlement, indicating the area is more developed, compared with areas dominant vegetation. However, it does not determine the level of welfare of the people. In the spatial planning of a region in Indonesia, there is a policy of spatial planning (RTRW). RTRW is a policy made by central or local governments to regulate the distribution of space respectively, and it is established through local regulations (called *Perda: Peraturan Daerah*). RTRW is divided into structure and pattern of spatial. This study focused on the study of spatial patterns (in this paper, if written spatial plan, its means is spatial pattern). The spatial planning regulation is Law No. 26 of 2007.

There are spaces that currently developing as planned, and there is also a growing space that is not in accordance with its plans, such as planning for wetland areas (paddy field), but currently at that location has been built housing, industry, or other uses. This condition is not aligned with the planned spatial pattern (RTRW) that has been created and defined. This un-conformity occurs generally due to weak control and law enforcement. This condition is common in Indonesia, including in Bodetabek areas (Bogor Depok, Tangerang and Bekasi), as the hinterland area of Metropolitan DKI Jakarta. The urban growth in the metropolitan region, and its impact on rural landscapes, has been influenced by the planning system (Paul, V and Tonts, M, 2005).

Another interesting phenomenon is the conformity of spatial planning in the district/city border areas. The indicator that can be used in viewing this condition to determine spatial pattern policy (RTRW) to the same land use, in each adjacent district/city. In the same land use, sometimes one of the districts is planning the land in its spatial plan as a protected or agricultural area, however, on the other side of the adjacent districts/city, the area is planning for residential areas, industry, or others. This condition can be preliminary description of spatial planning in each region (exploitative or conservative). In addition, this study also identifies policy conformity (RTRW spatial pattern). An example is a mixed garden spread across two districts/cities (borders), but planning in the spatial plan can be the same or different. The conditions dynamics of the land use and planning (in spatial planning) on areas at the district/city borders will be interesting to review and mapping.

The objectives of this study are: (1). Identify **land use** along the border of Bodetabek, (2). Identify the **spatial pattern** (spatial plan) along the border of Bodetabek, and (3). Analyze conformity between land use and spatial pattern (spatial plan) of each adjacent distric/city.

2. Methodology

2.1. Study Location

The study location is the area along the border in several districts/city in Greater Jakarta, namely Bogor Distric, Depok City, Bekasi City, Bekasi Distric, Tangerang Distric and South Tangerang City. Determination of study location based on withdrawal line 500 meter from districts/city boundary, determined by Bappeda respectively distric/city. The boundaries of the study sites and their respective border areas are presented in Figures 1. Total area with buffer 500 meters from right and left (1,000 m or 1 km) of district/city boundary is 1,551,20 hectares (in Figure 1, red line). Determination of the study location boundary to see the condition (general situation), especially the land use and spatial pattern RTRW in the border area.

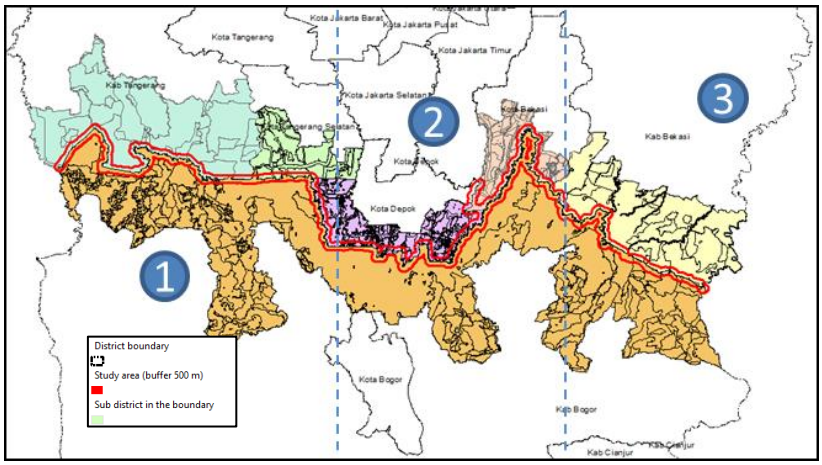

Figure 1. Study Location (red line)

2.2. Methods

The data used in this study include the spatial map (RTRW) of the district/city into a study, land use map, and other related data. District/city RTRW data (scale 1: 50,000), obtained from the Ministry of ATR/BPN (collected from Bappeda), and land use map (scale 1: 10,000) obtained from the Ministry of ATR/BPN (called *Peta Penggunaan Tanah*). The use of

land use maps from BPN is intended as a land use map that has a detailed scale, and it has the same land use nomenclature in some of these areas.

Stages of analysis include : 1) data preparation, 2). determination of study location boundary, 3). analyzes, 4). writing paper. Some of the analysis are used:

1. Analysis Geography Information System (GIS)

   GIS analysis included to prepare the study location (buffer), presents thematic maps (layouts), overlay, merge tabular data with spatial (join) and so on. An example of GIS analysis conducted in this study is determining the same land use (in the same polygon) in two adjacent districts/city, namely Bogor Distric with other districts (Detabek).

2. Tabular analysis to determine the conformity of spatial plans (RTRW) of distric/city in the study location.

   This analysis is used to identify the spatial plan in the study location. In addition, also to facilitate the interpretation and justification for further analysis. In general, the nomenclature of spatial pattern (RTRW) does not have a fixed standard, although it has been regulated in the laws and regulations of ministers. This condition is seen in districts/city in Indonesia, including those in Bodetabek who have (naming) different spatial plan.

3. Conformity matrix analysis of land use and spatial plan in border areas

   The conformity matrix analysis of land use and spatial plan was conducted to identify the confirmity between land use and spatial plan. In addition, the innovation of this research is not only to see the land use and spatial plan of each district/city, but also to see/compare the

   policies applied by the local government through the spatial pattern of RTRW on the same land use in both regencies/bordering on each other. So, it can be assessed the level of exploitative or conservative trends of local government policy (on the same land use). This is seen only from land use and spatial plan without considering other aspects. Land use matrix and spatial plan are presented in Figure 2.

Land Use	Spatial Plan	Industry	Industry, service	Area of Industry	Area of Trade and Service	Industrial area	Area of Puspiptek	Settlement of medium density	Settlement of high density	Rural Settlement Area	Settlement of medium density	Urban Settlement	Urban Settlement of Low Density	Urban Settlement of Medium Density	Urban Settlement of High Density	Residential of Low Density	Water infiltration	Lake border	Railroad border	River border	SUTT/SUTET border	The public cemetery	Agriculture Wetlands	Area of Agriculture Wetlands	Annual plants	Dryland Farming
Land Use	simbol	Ind						Settl									RTH						paddy		agric	
Moor / field	agric	ES						ER									S						S		S	
Mixed Gardens	agric																									
Fruit Gardens	agric																									
Low density "kampung" irregular	settl	S						S									TM						TM		TM	
High density "kampung" irregular	settl																									
High density residential	settl																									
Paddy field irrigation (2x paddy /year	paddy	ET						ET									ER						S		S	
2x paddy + palawija/year	paddy																									
paddy irrigation	paddy																									
Rainfed rice	paddy																									
Some of Industry	ind	S						TM									TM						TM		TM	
Open Pit Mining	ind																									
Small Industry	ind																									
Abandoned land	RTH	TM						S									S						S		S	
Public park	RTH																									
Sport field	RTH																									

Note: S= conform, ER= low exploitative,ES= moderate exploitative, ET=high exploitative, TM=not match

Figure 2. Conformity Matrix of Land Use vs Spatial Planning in Border Areas

4. Comparative analysis of spatial plans (RTRW) of districy/city in border areas

   In this analysis, there are any conformity between district/city spatial plans in border areas, especially on the same land use. For example, in the border area there are paddy fields that span across both districts/city, then we will see the spatial plan imposed on the paddy field in each district, conformity (S) or un-conformity (TS). Conformity matrix of both spatial plan (RTRW) presented in Figure 3.

Spatial Plan of Bogor	Spatial Plan of Other Distric	Settlement of medium density	Settlement of high density	Residential of MEdium Density	Urban Settlement	Residential of Low Density	Industry	Area of Industry	Area of Trade and Service	Area of Puspiptek	Agricultural Wetland	Dryland farming	Annual Plans	Sport and recreation facility	River border	Water infiltration	Green Open Space	Railroad border	Lake border	The public cemetery	SUTT/SUTET border	urban infrastructure	Agricultural Support Facilities
Spatial Plan of Bogor	Code	Settl					Ind				Agric			RTH								Fass	
Residential of Medium Density	Settl	S					SS				TS			TS								SS	
Rural Settlement Area																							
Urban Settlement of Low Density																							
Urban Settlement of Medium Density																							
Urban Settlement of High Density																							
Area of Industry	Ind	SS					S				TS			TS								TS	
Area of Agricultural Wetland	Agric	TS					TS				S			S								SS	

S= conform, SS=moderate conform, TS=un-conform

Figure 3. Matriks of Spatial Plan of Bogor vs Spatial Plan of Other Distric

3. Results and Discussion

3.1. Land Use

The land use data is sourced from the National Land Agency (BPN). The land use classification system of the National Land Agency (BPN) based on NSPK 2012. The classification system are classification system consists of 90 classes, 1: 10,000 map scale, land use based on specific functional approaches and activities/types of land use, and the clustering is divided into two, is vegetation and non-vegetation areas, especially agricultural areas and built areas. Typology of land used based on BPN data is presented in Table 1.

Table 1. Typology of BPN Land Use, scale 1: 10.000

Classification system	Vegetation area	Non vegetation area
Land Cover Classification, based on NSPK BPN 2012 (scale 1: 10.000)	**Agricultural area** 2x paddy / year irrigated paddy field, irrigated paddy field over 2x paddy / year, irrigated paddy fields 1x paddy / year, rainfed paddy fields, 2x paddy + palawija / year, 1x paddy / year + palawija / year, 2x paddy paddy fields / year , tidal paddy fields over 2x paddy / year, tidal 1x paddy + palawija / year, tidal 2x paddy + palawija / year, lebak, mixed plantations, plantations already produced, un-produced plantations, dryland farms, fruits, vegetable crops, medicinal plants, ornamental plants, large livestock farms, small livestock farms, poultry farms, mix garden, other farms	**Open land** sand dune, lava flow ground, degraded soil, barren soil, temporary open ground, other open land, vacant land already earmarked
	Non-Agriculture Area forests, natural forests, artificial forests, forest groves, grasslands, savannas, grasslands, bush, wilderness	**Settlement and Non-Agriculture Area** high density housing, medium density housing, kampung of high density regular, kampung of medium density irregular, sport building, sport field, historic site, city forest, city park, public park, private park, trade service, tourism services government services, education services, health services, financial services, transportation services, professional services, religious services, rental services, telecommunication services, cleaning services, other services, basic chemical industries, basic machinery and metal industries, various industries, workshop, warehousing, installation, grave / funeral, airport, port, open pit, closed mine, other mining

Based on the identification results, in the study area has 61 types of land use. The land use in the border area (Appendix 1) have not been selected on the same land use. Types of land use include paddy + palawija, industries area, lake, housing, forest, sport building, road,

government institution service, moor, plantation, etc. The complete data and spatial distribution as presented in Appendix 1.

3.2. **Spatial Pattern/Spatial Planning (RTRW)**

Legislation related to the determination of the spatial pattern of the district and city spatial planes has been set forth in Law No. 26 of 2007 on spatial planning, and then one of them is downgraded to Regulation of the Minister of Public Works No. 16/2009 and No. 17/2009. Regulation of the Minister of Public Works No. 16/2009 on guidelines for the preparation of distric RTRW, meanwhile, Regulation of the Minister of Public Works No. 17/2009 on guidelines for the preparation of city RTRW. All rules, including the systematics and stages of compilation of documents are described in the ministerial regulation. Nevertheless, several RTRW documents (made by the local government), particularly the nomenclature of spatial patterns RTRW of distric/city in Bodetabek still have some differences in the use of nomenclature. For example, in the spatial pattern of Bogor Distric there is allocation of space for nature conservation area *("kawasan pelestarian alam")*, meanwhile, in other area also have similar spatial pattern like nature sanctuary and nature conservation (*"kawasan suaka alam dan pelestarian alam")* in Bekasi, and so on. However, some of them have also used the same term, such as protected areas, natural disaster prone areas and so on.

The spatial planning is suggested that a departure from a purely 'land-use' planning model offers a means of delivering multi-functional spaces that perform across different social, economic and environmental dimensions (Gallent, N and Shaw, D, 2007). The nomenclature variety of the land use classification and spatial plans adopted by local governments, will make it difficult to do the planning in an integrated region. Various obstacles arise, especially in defining the concept of this nomenclature. For example in "*kewilayahan*" nomenclature such as "*wilayah*", "*kawasan*", "*daerah*" "*regional*", "*area*" , "*ruang*" and similar terms, are widely used and mutually exchangable notions, although each has a different emphasis. The inconsistency of the term sometimes causes ambiguity of understanding, and is often confusing (Rustiadi, 2009).

Based on the inventory results, comparison of the nomenclature number of spatial patterns in the study area is presented in Appendix 3. Meanwhile, the distribution of spatial

pattern allocation in the study area, and the border district areas is presented in Figure 5. According to Appendix 3, the amount of space allocation in the spatial pattern (RTRW) district/city at most study sites, are in Depok (24 spatial patterns), followed by Bekasi Regency (22 spatial patterns).

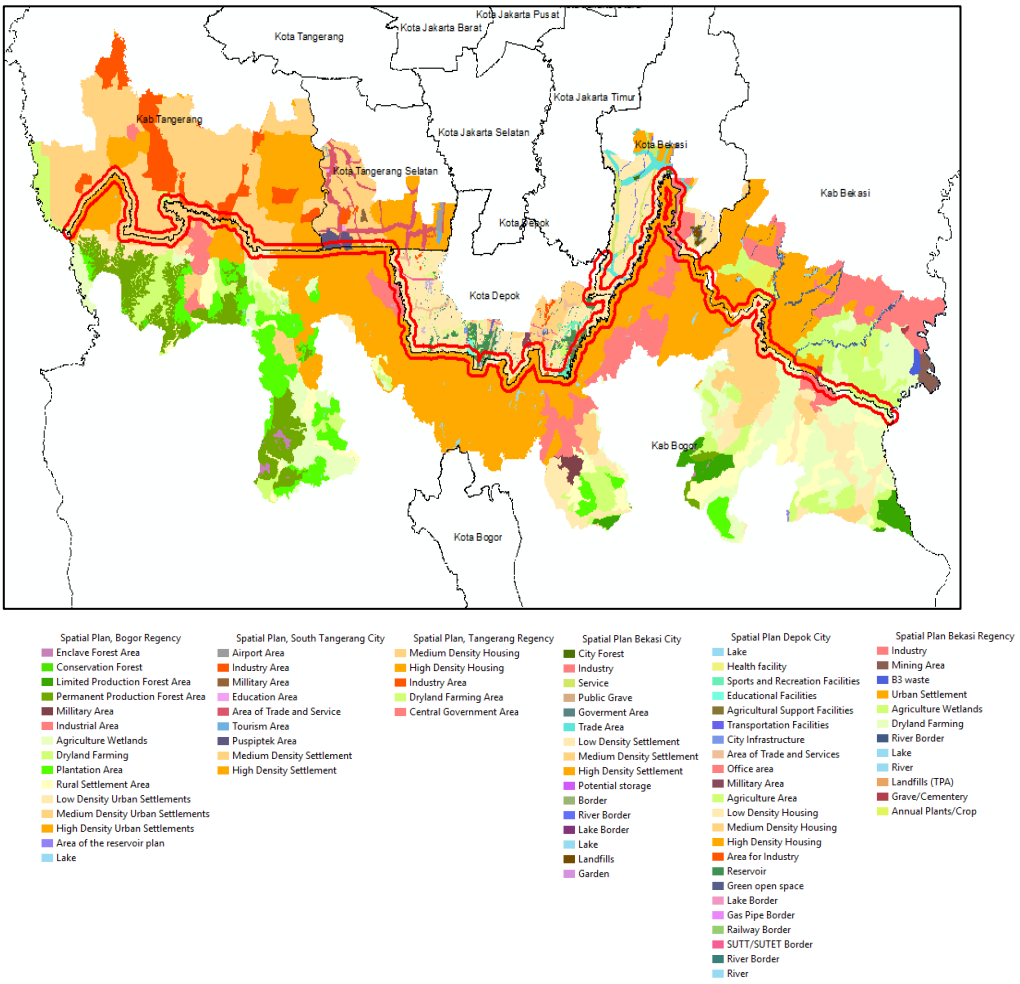

Figure 5. Spatial Pattern in Study Location (sub distric in the border area)

3.3. **The Same Land Use in the Both Districts**

The border area used in this study is the border area between Bogor Distric in the South with some other districts/cities (including Jabodetabek) on the northern side. Based on

the identification result, it is found that the same land use (in one expanse) in two district/city is known similar land use in two adjacent districts, it is 5.518 hectares, spread over all district/city. The same land use are 2x paddy+palawija/year, industry area, "kampung" medium density irregular, "kampung" high density irregular, fruits garden, mix garden and so on. The completed spatial distribution is presented in Figure 6 and Appendix 2.

The same land use on the border, the most extensive is the land between Bogor Distric with Bekasi Distric, and then followed by land on the border of Bogor Distric with Depok City. Same land use an area Bekasi District-Bogor District (South) is 984,46 ha (17,88%), followed Bekasi District (North) is 945 ha (17,17%).

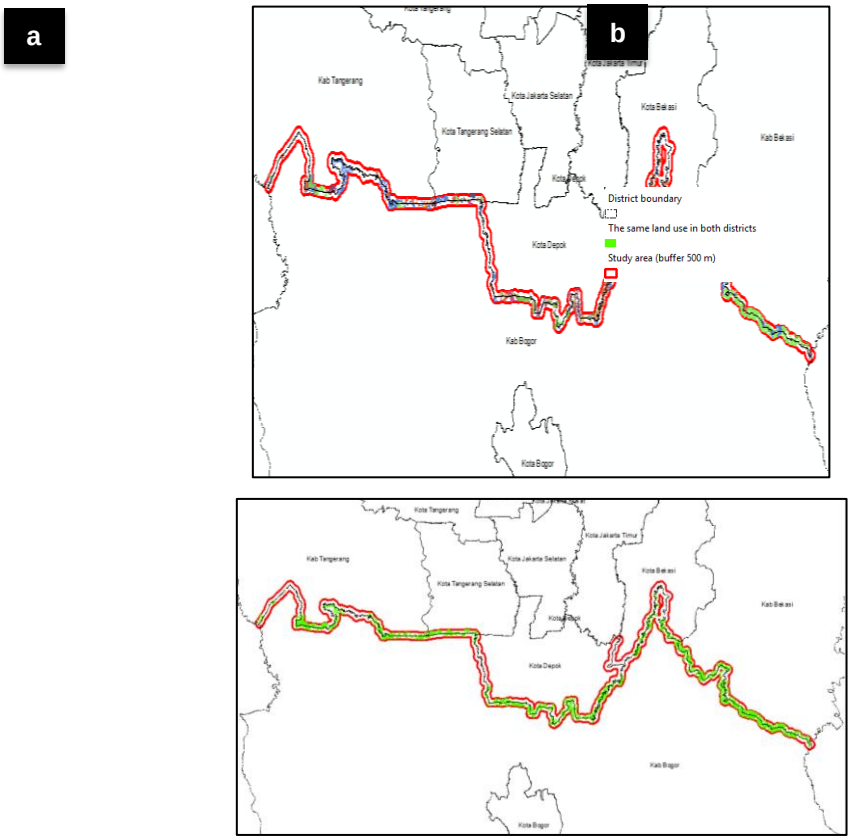

Figure 6. Same Land Use Distribution in The Both Districts (a). Detailed (legend is the same as Appendix 1), (b). Generalization (green area)

3.4. **Land Use and Spatial Plan in The Both Districts**

In this a section analysis is to see the conformity of the same land use and spatial plans. In this paper, the degree of conformity between land use and spatial plan (RTRW) is divided into several levels, including: low exploitative (ER), moderate exploitative (ES), high exploitative (ET), conform (S) and un-match (TM). The term TM means that land use is now in the form of constructed land, but in its spatial plan is allocated for green open spaces or agriculture. For example, the settlements land use (excisting condition), but in the spatial pattern allocated to parks or green open space. This condition, in addition to un-matched can also be identified as a spatial inconsistency.

The same land use as the largest area is land use between Bogor Distric and Bekasi Distric, followed by Bogor Distric with Depok City. More data is presented in Table 2.

The analysis results of an interesting is on the dynamics of land use for paddy fields, but in the spatial plan (RTRW document), it is allocated as a settlement area (coded ET). Based on Table 2, the area with paddy field (existing land use), but the spatial plan allocated for housing (settlement). The area is the most extensive on the border of Bogor Distric, which is 3.043 ha, because as it borders five other districts/cities, followed by the border of Depok City. such as urban settlement areas, high density, medium, low density and so on. It shows that policies needed in land use control in the future, to maintain purpose achievement of spatial plan in this region (Kurniati, DN, Rustiadi, E, Baskoro, DPT, 2015). Un-conform area this show as it is said Durey and Mwangi, 2014, land-use planning is lacks integration, as seen in the disconnect between spatial planning, land administration, land data, watershed management and other elements of land-use planning.

Table 2. Conformity Between Land Use and Spatial Plan on The Border Area

No	District/city	ER	ES	ET	S	TM	No data	Tota (ha)	%
1	Bekasi District	233.37	158.74	382.78	125.53	53.91	0.00	**954.34**	**17.29**
2	Bogor District	1655.59	314.28	615.24	431.73	20.58	6.41	**3043.83**	**55.16**
	- Kab Bekasi-Kab Bogor	177.89	247.30	460.21	94.20	4.86	0.00	984.46	
	- Kab Tangerang-Kab Bogor	559.78	30.19	87.07	2.03	10.13	0.00	689.21	
	- Kota Bekasi-Kab Bogor	327.13	0.00	5.39	27.14	0.00	0.00	359.67	
	- Kota Depok-Kab Bogor	535.45	36.80	44.52	271.26	5.59	0.00	893.62	
	- Kota Tangsel-Kab Bogor	55.78	0.00	17.47	32.25	0.00	0.00	105.51	
3	Tangerang District	309.67	4.01	165.88	31.58	1.76	0.00	**512.89**	**9.29**
4	Bekasi City	153.41	0.00	3.46	42.51	0.00	0.00	**199.37**	**3.61**
5	Depok City	304.27	33.47	17.46	281.48	8.07	8.66	**653.40**	**11.84**

6	Tangerang Selatan City	99.09	0.00	13.12	42.09	0.00	0.00	**154.30**	**2.80**
	Total (ha)	**2755.39**	**510.50**	**1197.92**	**954.91**	**84.33**	**15.06**	**5518.12**	**100.00**
	%	**49.93**	**9.25**	**21.71**	**17.31**	**1.53**	**0.27**	**100.00**	

Note: ER (low exploitative), ES (moderate exsploitative), ET (high exploitative), S (conform), TM (un-match), No data

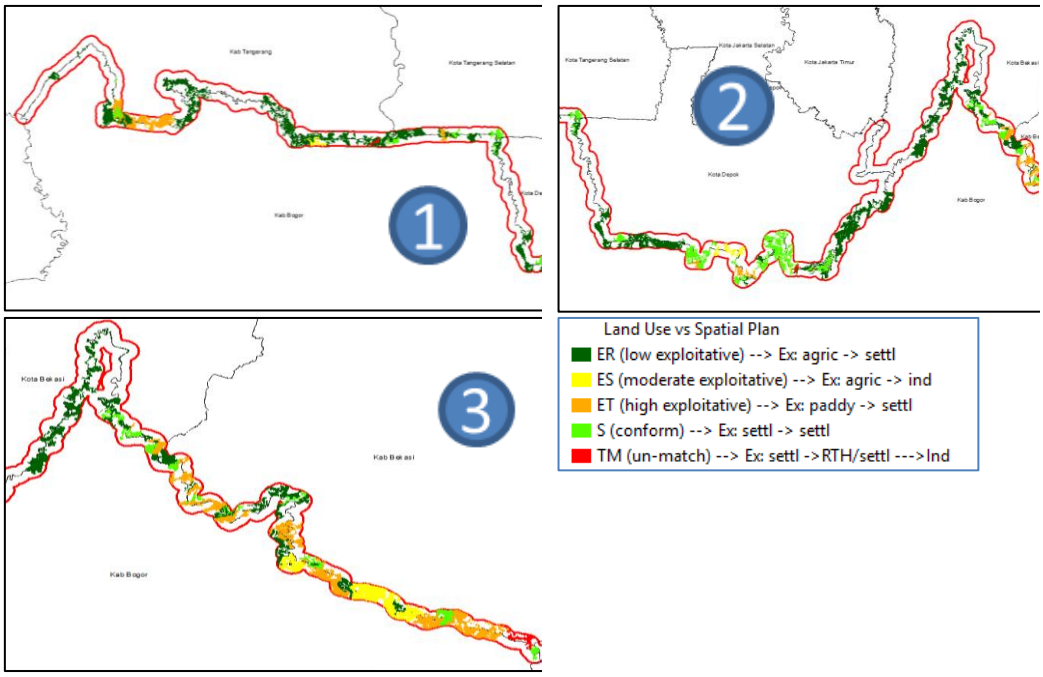

Figure 7. Land Use and Spatial Plan in The Both Districts

3.5. **Spatial plan in the both districts**

In this chapter will be analyzed conformity of spatial pattern (RTRW) between two districts/city, which are adjacent to the same land use (similar designation). The results show "conform", if the spatial plan in both areas has the same allocation (policy) to the same land use. For example, in adjacent areas, Bogor District is planned in the RTRW for urban areas, meanwhile, adjacent areas Bekasi District are also planned for medium-density settlement areas or others, then the condition is conform area (coded S). Furthermore, in adjacent areas, one of the areas is allocated as a residential area, while the adjacent area is allocated as an industrial area (or others), so in this study it is including in moderate conform area (caded SS). Meanwhile, in this study has the un-conform area (TS code), if one of the region is allocated as residential area or industry, while other area is allocated as agricultural area or green open space. Results of analysis are presented on Table 3 and Figure 8.

Table 3. Spatial Plan in The Both Districts

No	District/city	S	SS	TS	(blank)	Total (ha)	%
1	Bekasi District	321.19	515.78	117.37		954.34	17.29
2	Bogor District	768.21	2091.01	178.20	6.41	3043.83	55.16
	- Bogor District-Bekasi District	168.5012836	666.4111536	149.5442323		984.4566695	
	- Bogor District-Tangerang District	338.316717	350.8938889			689.210606	
	- Bogor District-Bekasi City	14.12745443	316.8819351	28.65687484		359.6662644	
	- Bogor District-Depok City	139.9507085	753.664978			893.6156865	
	- Bogor District-Tangsel City	104.8876096	0.618302038			105.5059117	
3	Tangerang District	440.27	72.62			512.89	9.29
4	Bekasi City	14.26	179.68	5.43		199.37	3.61
5	Depok City	44.48	600.27		8.66	653.40	11.84
6	Tangerang Selatan City	154.30				154.30	2.80
	Total (ha)	**1742.71**	**3459.36**	**300.99**	**15.06**	**5518.12**	**100.00**
	%	**31.58**	**62.69**	**5.45**	**0.27**	**100.00**	

Note: S (conform), SS=moderate conform, TS=un conform

The largest border area of conformity policy is Bogor District, which is 3.043,83 hectare. Overall, the same land use area shows the level of conformity policy between the two border areas is 31%. Meanwhile, the moderate conform area is 62%, and un-conform at 5%.

Conclusion

This research is to see the dynamics of land use and spatial planning in the border area of both regions (Bodetabek). Generally, this kind of research only sees dynamics within its territory, but in this study, in addition to see the dynamics within its own territory, it is also compared with the dynamics in other adjacent areas. The comparison is seen from the dynamics of land use and spatial planning on the same land use and spread in both distric/city areas. The results of this analysis are the results of **preliminary research**, and as initial information for more comprehensive research.

The same land use along the border between Bogor Distric (South) and other districts (North) of 5.518 hectares. The land uses are paddy field + palawija, settlements, mixed gardens, moor, industry, paddy fields. As many as 20 similar land use are identified in two adjacent districts. In the same land use, the conformity between land use and spatial plan shows that most of them have low exploitative policies, is 49% of all areas with the same land

use on the border (distric/city) and only 17% are conform area. Furthermore, the same land use in the border area, the conformity of spatial plan in both areas are 31%, while the moderate conformity is 62% and 5% un-conform.

This research can be used as initial input for local government (especially for un-conform area), whose area is adjacent, in order to achieve conformity spatial planning. The long-term impact is the achievement of an integrated environment in the Bodetabek area.

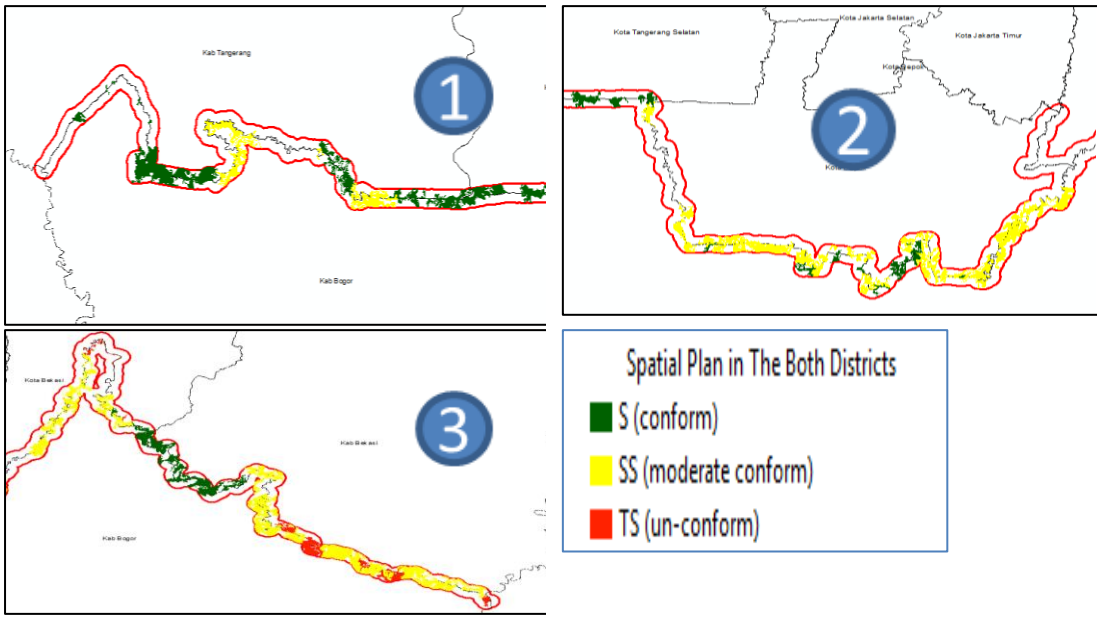

Figure 8. Spatial Plan in The Both Districts

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