REFERRAL OF REGIONAL SPATIAL PLANS (RTRW) BY ANALYTICAL HIERARCHY PROCESS (AHP) METHOD (CASE STUDY: EAST KALIMANTAN PROVINCE)

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BACKGROUND

- **The Importance of Spatial Planning**

  Spatial planning is needed to overcome the competition and conflict between different utilization within a limited area. Spatial plans that do not comply with the suitability of land, will result in damage to the land.

- The Importance of Spatial Development Methods

  Poor baseline data characteristic for planning and management of the Mahakam river basin and the absence of reference Detailed Spatial Plan (RDTR) arrangement resulted in unplanned land use and environmental damage (Harijono in Susilowati 2010).

HYPOTHESIS & RESEARCH AIM

REGIONAL SPATIAL PLANS
Needed to overcome the competition and conflict between different utilization within a limited area.

THE BEGINNING OF REGIONAL SPATIAL PLANS	THE END OF REGIONAL SPATIAL PLANS

AHP Method (Analytical Hierarchichal Process)
Method of Analytical Hierarchy Process (AHP) is helping to solve complex problems with the structuring of a hierarchy of criteria, interested parties, results and by attracting a variety of considerations in order to develop a weight or priority

RESEARCH AIM

This study aims at Referral of Regional Spatial Plans (RTRW) by Analytical Hierarchy Process (AHP) Method with case study East Kalimantan Province
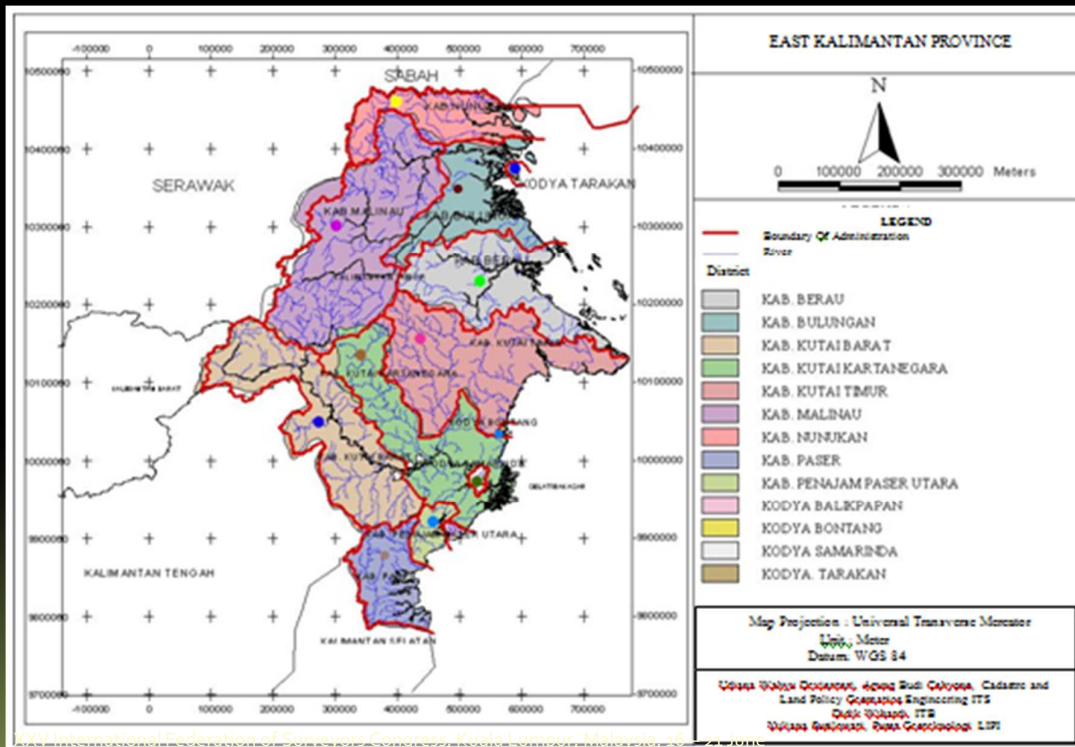

Hypothesis

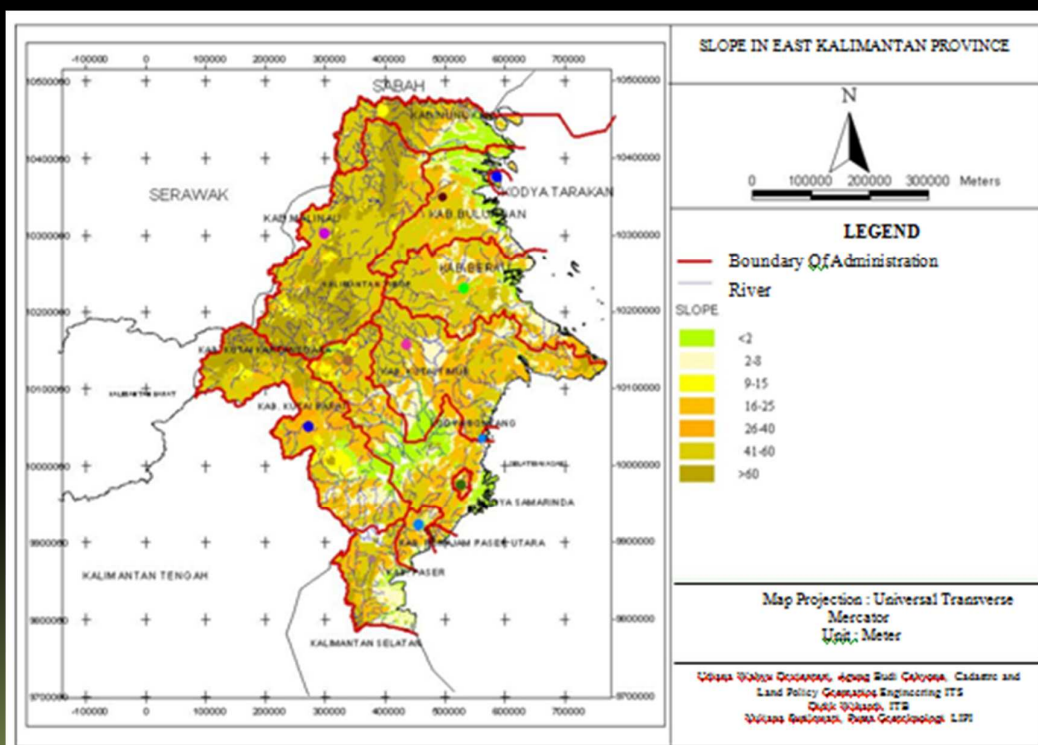**AHP method can be applied in spatial planning to produce a better regional spatial planning.**

- Generation of alternative (scenario analysis).
- Accommodate the preferences of stakeholders.
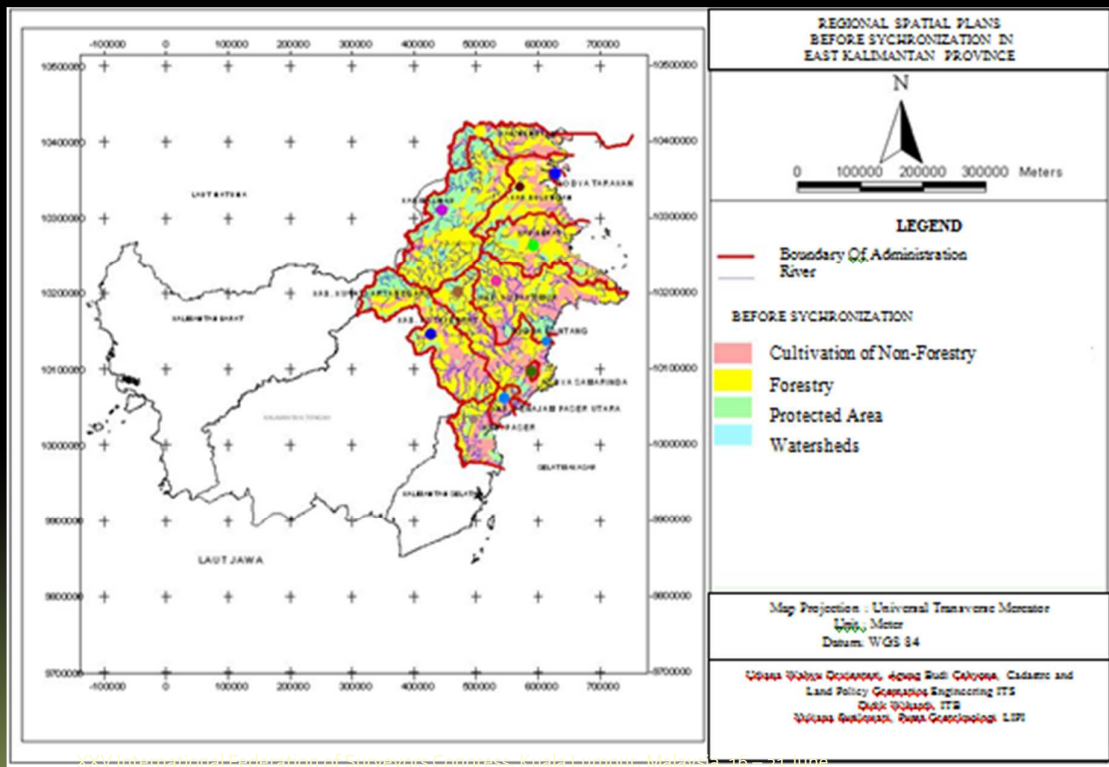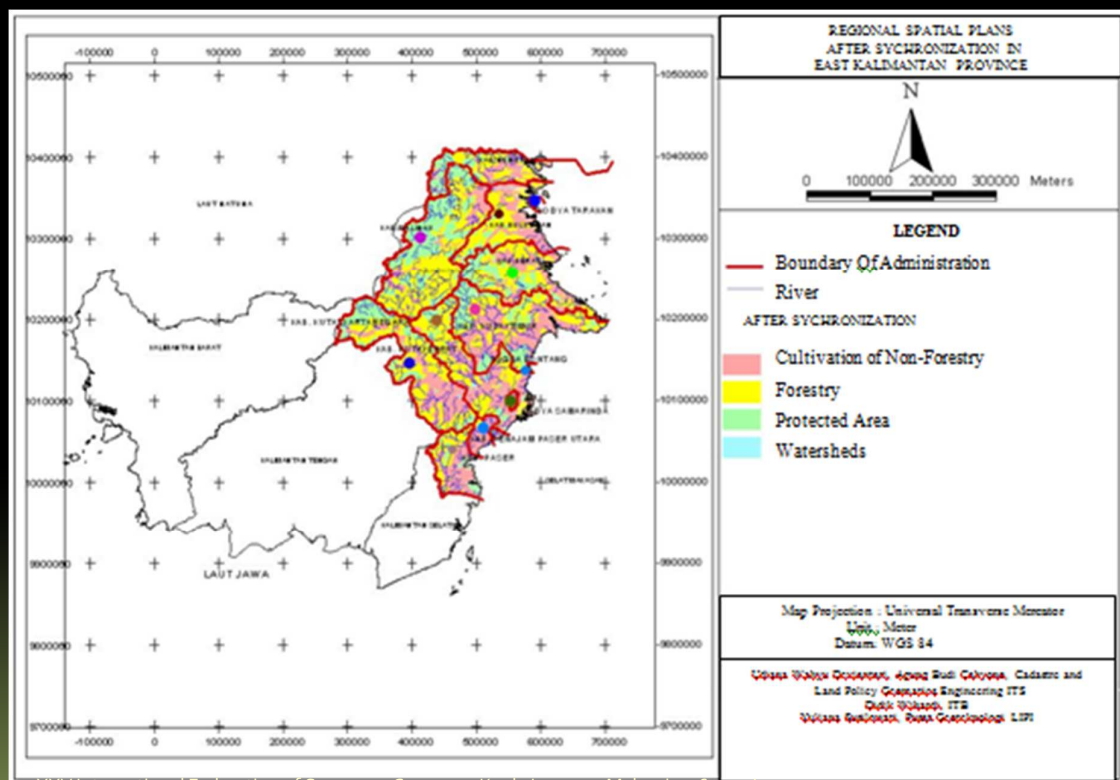- To conduct the analysis by using more criterias

RESEARCH AREA

SLOPE MAP

PRECIPITATION MAP

SLOPE MAP

The Beginning Of Regional Spatial Plans

The End of Regional Spatial Plans

CHANGE OF SYCHRONIZATION MAP IN
EAST KALIMANTAN PROVINCE
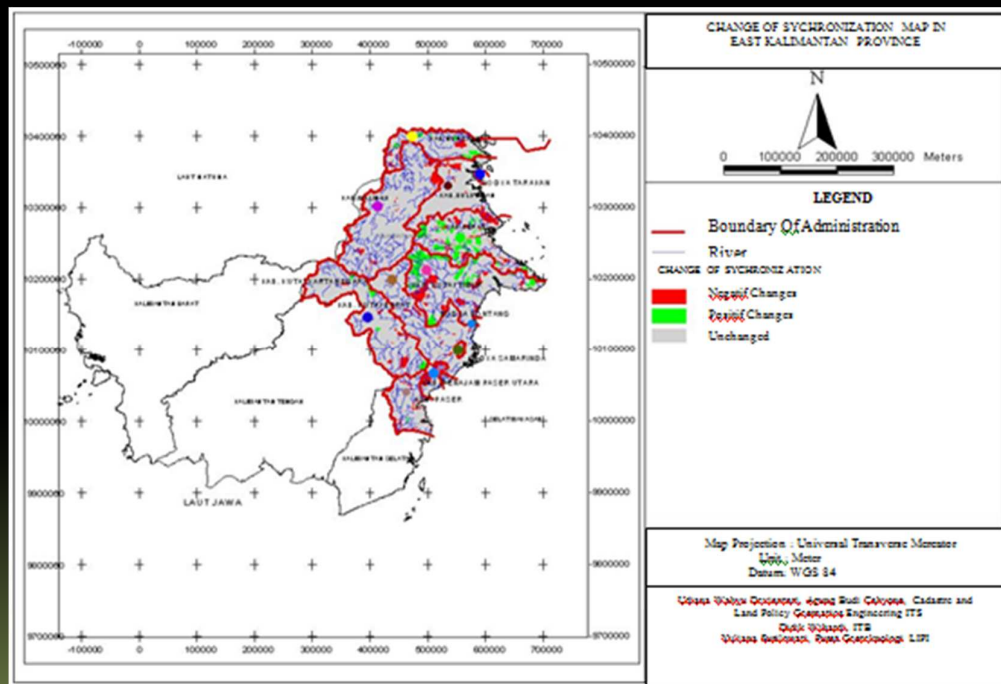
The Analysis Of The Regional Spatial Plans

THE BEGINNING OF REGIONAL SPATIAL PLANS		THE END OF REGIONAL SPATIAL PLANS	
Regional Spatial Plans	(%)	Regional Spatial Plans	(%)
Non-Forestry Cultivation Area (KBNK)	26.29	Non-Forestry Cultivation Area (KBNK)	39.63
Forestry Cultivation Area (KBK)	49.94	Forestry Cultivation Area (KBK)	32.66
Protected Area	23.46	Protected Area	27.25
Watersheds	0.41	Watersheds	0.41
Total	100	Total	100

- Increasing number of KBNK is 13.34%
- Decreasing number of KBK is 17,28 %

Environmental Carrying

CRITICAL LAND MAP
IN EAST KALIMANTAN PROVINCE
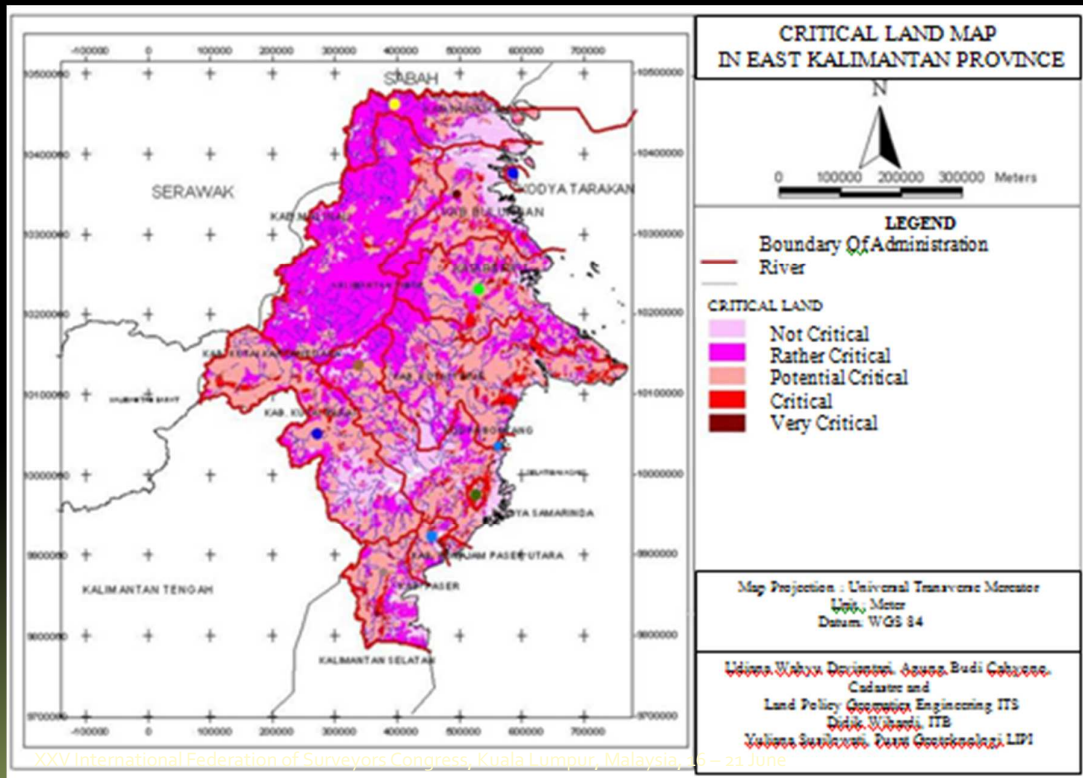
CRITICAL LEVEL	AREA (Ha)	%
Not Critical	2,553,753.66	13.14
Rather Critical	8,510,773.93	43.80
Potential Critical	7,367,163.60	37.91
Critical	994,586	5.12
Very Critical	5,352.45	0.03
Total	19,431,629.79	100.00

Critical land obtained from the slope, soil, Land cover, and precipitation

Regional Spatial Plans vs Environmental Carrying Capacity
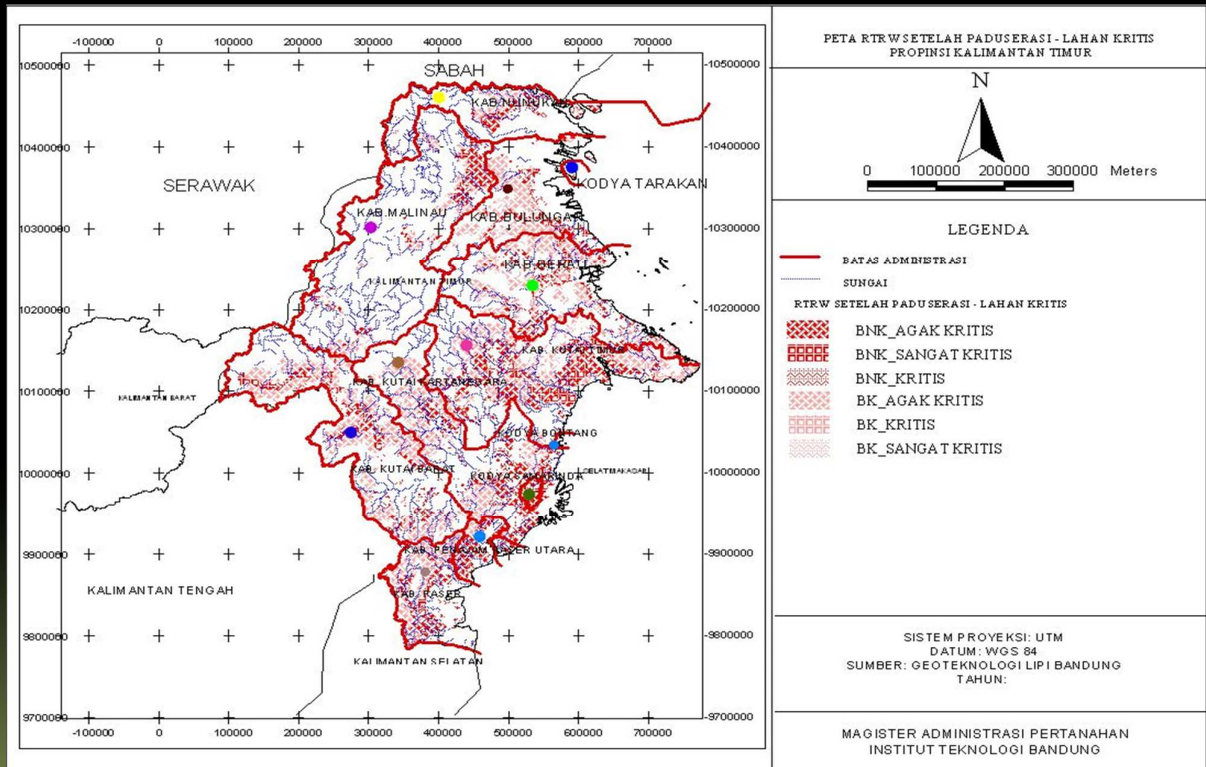
Critical Level (%)	THE BEGINNING OF REGIONAL SPATIAL PLANS					THE END OF REGIONAL SPATIAL PLANS				
	Non Forestry Cultivation Area (KBNK)	Forestry Cultivation Area (KBK)	Protected Area	Watersheds	Total	Non Forestry Cultivation Area (KBNK)	Forestry Cultivation Area (KBK)	Protected Area	Watersheds	Total
Not Critical	6.78	4.28	1.13	1.77	13,96	7.66	3.31	1.22	1.77	13.96
Potential Critical	5.53	17.33	14.56	0.04	37,46	6.78	14.45	16.19	0.04	37.46
Rather Critical	9.02	26.92	7.41	0.05	43.4	13.34	20.8	9.21	0.05	43.4
Critical	4.06	0.93	0.07	0.02	5.07	4.06	0.93	0.07	0.02	5.07
Very Critical	0.08	0.03	0	0	0.11	0.08	0.03	0	0	0.11
Total	25.47	49.48	23.17	1.88	100	31.91	39.52	39.52	1.88	100

In the beginning of regional spatial plans
Critical land was dominated by the Non-Forestry Cultivation Area (KBK) and Forestry Cultivation Area (KBNK) with a rather critical area of KBK 26.92% and KBNK 9.02%

In the end of regional spatial plans
Critical land dominated by the Non-Forestry Cultivation Area (KBNK) and Forestry Cultivation Area (KBK) with a rather critical area on KBK 20.8% and KBNK 13.34%

LAND SUITABILITY MAP

Regional Spatial Plans vs LAND SUITABILITY

Comodities	THE BEGINNING OF REGIONAL SPATIAL PLANS					THE END OF REGIONAL SPATIAL PLANS				
	Non Forestry Cultivation Area (KBNK)	Forestry Cultivation Area (KBK)	Protected Area	Watersheds	Total	Non Forestry Cultivation Area (KBNK)	Forestry Cultivation Area (KBK)	Protected Area	Watersheds	Total
Agriculture										
N	3,564,930.87	8,649,013.00	4,356,485.06	35,134.40	16,605,563.34	4,449,084.98	6,996,066.74	5,122,922.60	35,187.49	16,603,261.81
S	1,548,579.98	1,021,757.75	231,725.97	24,002.75	2,826,066.45	1,869,347.88	715,648.97	219,310.19	24,060.94	2,828,367.98
Total	5,113,510.86	9,670,770.75	4,588,211.03	59,137.16	19,431,629.79	6,318,432.86	7,711,715.71	5,342,232.79	59,248.43	19,431,629.79
Plantation										
N	2,094,711.55	3,018,921.25	3,808,489.48	28,080.25	5,931,281.28	2,353,282.80	5,346,780.84	4,519,933.28	28,073.65	12,248,070.57
S	3,018,921.25	3,640,922.40	733,345.05	55,677.32	7,448,866.02	3,917,694.42	2,699,342.42	776,102.09	55,762.96	7,448,901.88
Total	5,113,632.80	9,692,405.00	4,541,834.54	83,757.57	19,431,629.79	6,270,977.22	7,780,780.60	5,296,035.37	83,836.60	19,431,629.79
Mining										
N	2,693,957.18	6,389,308.66	3,876,604.70	63,647.52	13,023,518.06	3,106,216.19	5,346,780.84	4,505,436.96	63,726.54	13,022,160.53
S	2,334,633.79	3,182,682.73	874,121.49	16,673.71	6,408,111.73	2,940,213.13	2,447,880.17	1,004,702.23	16,673.72	6,409,469.25
Total	5,028,590.96	9,571,991.40	4,750,726.19	80,321.23	19,431,629.79	6,046,429.32	7,794,661.02	5,510,139.19	80,400.27	19,431,629.79
Forestry										
N	2,238,845.97	6,580,773.65	3,989,639.84	22,351.4	12,831,610.86	2,591,863.22	5,493,863.34	4,723,558.27	22,326.03	12,831,610.86
S	2,902,474.78	3,071,106.66	602,034.79	24,402.7	6,600,018.93	3,684,064.92	2,261,332.43	630,218.88	24,402.7	6,600,018.93
Total	5,141,320.75	9,651,880.31	4,591,674.63	46,754.10	19,431,629.79	6,275,928.14	7,755,195.77	5,353,777.15	46,728.73	19,431,629.79

Regional Spatial Plans of Land Suitability

Cultivated area is triggered by the presence of land suitability for a particular commodity but must still consider the carrying capacity of the land.

- In the beginning of regional plans, there is the potential suitability accordingly (Suitability) with an area of 1,548.579.98 ha for KNBK and 1,021,757.75 on KBK for agricultural commodities. Agricultural commodities have the potential suitability of land with an S area 3,018,921.25 ha of KBNK and 3,640,922.40 ha of the KBK. Mining commodities have the potential suitability of land with an S area 2,334,533.79ha for KNK and 3,182,682.73 ha of KBK. Commodity forestry land suitability with an S area and 3,071,106.66 ha for KBNK and 2,902,474.78 ha of KBK.

- In the end of regional plans also have the potential suitability accordingly (Suitability), which increased the area of 1,869,347.88 ha in KNBK and decreased to 715,648.97 ha for agricultural commodities on KBK. For agricultural commodities have increased the potential for land suitability with an S area 3,917,694.42 ha in KBNK and decreased to 2,699,342.42 ha on KBK. And for mining commodities have the potential suitability of land with an S area and KBNK 2,940,213.13 ha and 2,447,880.17 ha on the KBK. Commodity forestry land suitability with an S area and KBNK 3,648,064.92 ha and 2,261,332.43 ha for KBK.

The Findings of Regional Spatial Plans

Regional Spatial plans in East Kalimantan Provinces :

- 5,294,720.11 **ha Forestry Area (27.25%)**
- 6,345,428.99 **ha KBK (**32.66**%)**
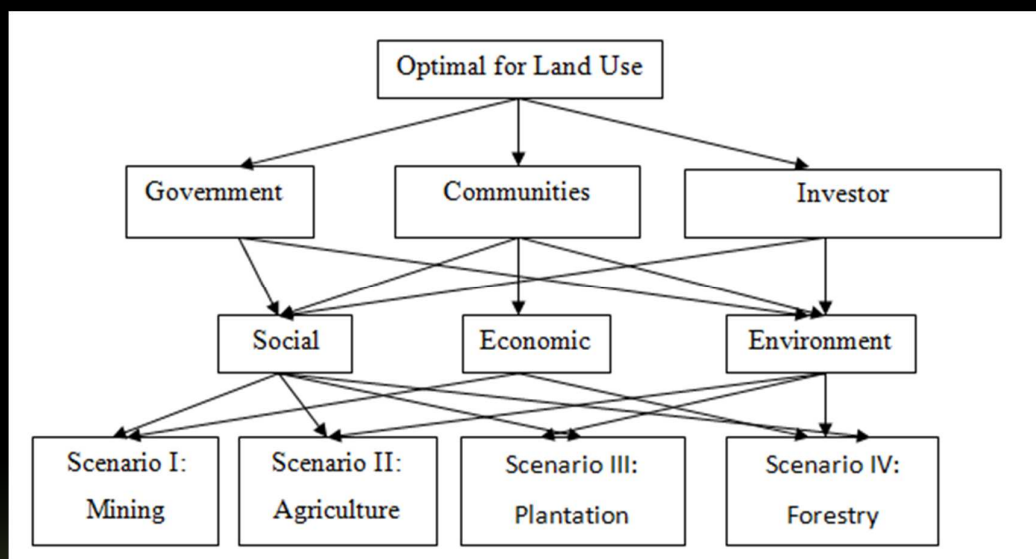- 7,712,336.51 **ha KBNK (**39.63**%)**

4.4 RTRW vs Enviromental Carrying

- Critical land dominated by the Non-Forestry Cultivation Area (KBNK) and Forestry Cultivation Area (KBK) with a rather critical area on KBK 20.8% and KBNK 13,34%

4.5 RTRW vs Land Suitability

- encourage land suitability for cultivation area.

Optimization Hierarchy for Land Use

There are three purposes of using AHP:
- Selecting of Commodities in the overlapping area
- Networking preferences of stakeholders in decision-making
- Performing analysis with multiple criteria

SCENARIO 1 (PRIORITY MINING I)

PRIORITY MINING ALTERNATIVE IN EAST KALIMANTAN PROVINCE
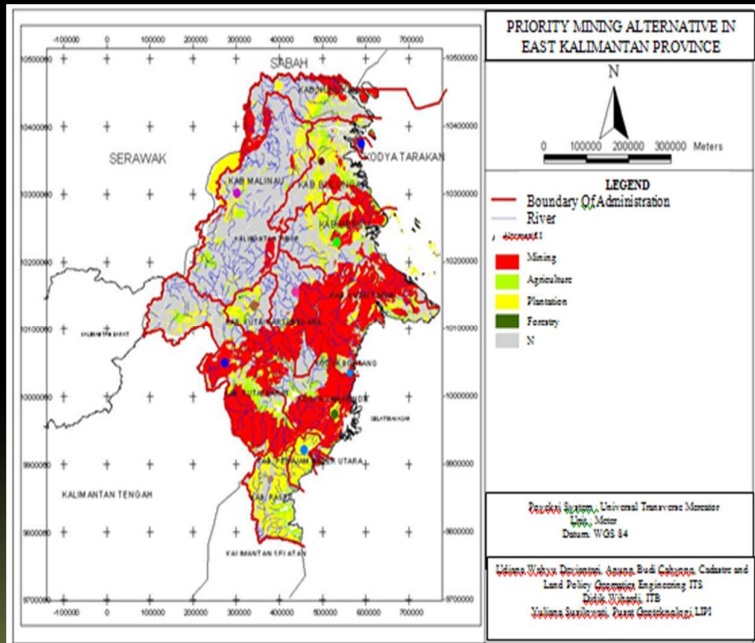
	SKENARIO I
PERTAMBANGAN	5,901,770.61
PERTANIAN	1,269,667.35
PERKEBUNAN	2,902,233.78
KEHUTANAN	0.00
NNNN	9,357,958.06

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SCENARIO 2 (PRIORITY AGRICULTURE I)

PRIORITY AGRICULTURE ALTERNATIVE IN EAST KALIMANTAN PROVINCE
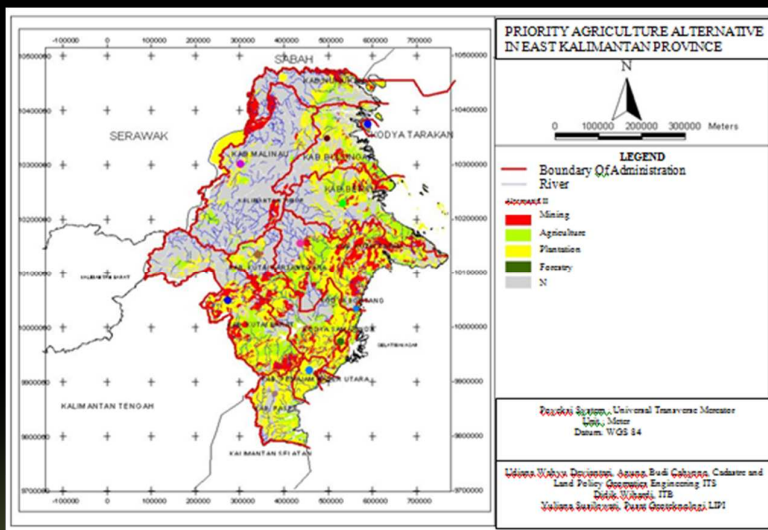
	SKENARIO II
PERTAMBANGAN	2,175,186.88
PERTANIAN	2,547,114.36
PERKEBUNAN	5,351,370.50
KEHUTANAN	0.00
NNNN	9,357,958.06

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SCENARIO 3
(PRIORITY PLANTATION I)
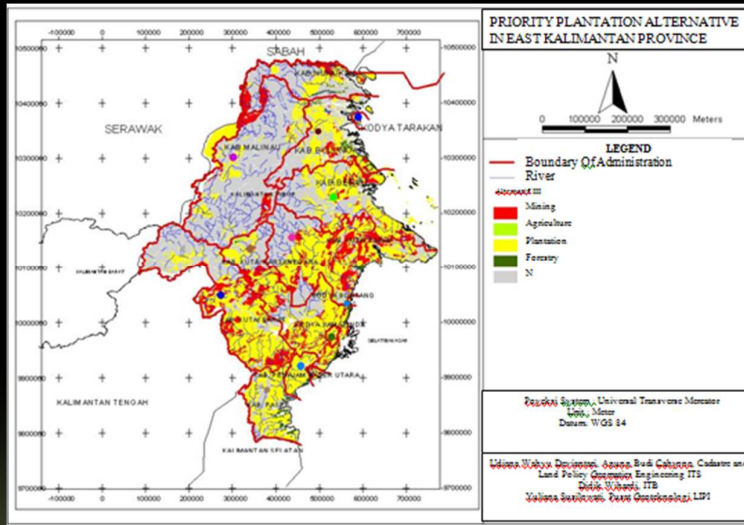
	SKENARIO III
PERTAMBANGAN	2,194,204.17
PERTANIAN	30,000.95
PERKEBUNAN	7,588,810.51
KEHUTANAN	260,656.10
NNNN	9,357,958.06

SCENARIO 4
(PRIORITY FORESTRY I)
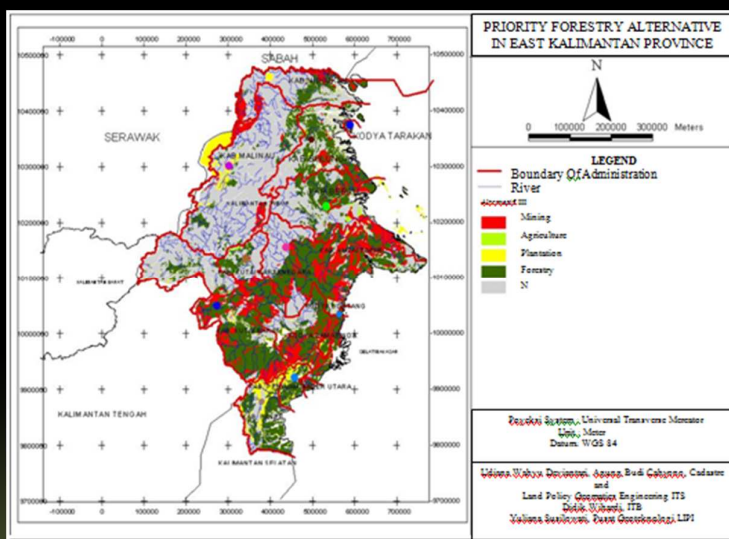
	SKENARIO IV
PERTAMBANGAN	2,690,929.70
PERTANIAN	74,766.53
PERKEBUNAN	1,009,844.12
KEHUTANAN	6,298,131.39
NNNN	9,357,958.06

Data Area Commodities-Priority Designation

Commodity	The End Of Regional Spatial Plans (forestry Area) (%)			
	Scenario I	Scenario II	Scenario IIII	Scenario IV
Mining	27.57	8.52	8.85	11.49
Agriculture	5.25	12.57	0.3	0.71
Plantation	12.48	24.21	34.47	3.47
Forestry	0	0	1.68	29.63

Commodity	Land Use %	Land Suitable (%)			
		Scenario I	Scenario II	Scenario IIII	Scenario IV
Mining	0.17	30.37	11.19	11.29	13.85
Agriculture	7.38	6.53	13.11	0.15	0.38
Plantation	1.3	14.94	27.54	39.05	5.2
Forestry	72.67	0	0	1.34	32.41

Commodity	Critical Land(%)			
	Scenario I	Scenario II	Scenario IIII	Scenario IV
Mining	20.86	7.74	7.67	9.56
Agriculture	0.75	2.77	0	0.07
Plantation	11.72	22.82	25.4	4.24
Forestry	0	0	0.26	19.47

Commodity	No Critical Land(%)			
	Scenario I	Scenario II	Scenario IIII	Scenario IV
Mining	9.51	3.45	3.62	4.29
Agriculture	5.78	10.34	0.15	0.31
Plantation	3.22	4.72	13.66	0.96
Forestry	0	0	1.08	12.94

Commodity	The End Of Regional Spatial Plans (Cultivation of no forestry Area)(%)			
	Scenario I	Scenario II	Scenario IIII	Scenario IV
Mining	4.3	2.88	2.9	3.14
Agriculture	0.84	1.07	0.06	0.12
Plantation	1.37	2.55	3.41	0.45
Forestry	0	0	0.15	2.81

Scenario I,II are the best in area commodities
Agriculture area must be increased

PREFERENSI STAKE HOLDER

MASYARAKAT	SOSIAL		EKONOMI		LINGKUNGAN	
	-	+	-	+	-	+
PERTAMBANGAN	6	2	6	4	8	1
PERTANIAN	2	8	2	8	2	8
PERKEBUNAN	6	2	6	4	6	2
KEHUTANAN	4	2	6	6	6	4

PEMERINTAH	SOSIAL		EKONOMI		LINGKUNGAN	
	-	+	-	+	-	+
PERTAMBANGAN	4	6	3	8	6	5
PERTANIAN	2	5	2	2	3	3
PERKEBUNAN	4	6	4	7	5	5
KEHUTANAN	3	5	4	6	5	6

INVESTOR	SOSIAL		EKONOMI		LINGKUNGAN	
	-	+	-	+	-	+
PERTAMBANGAN	4	6	5	9	6	5
PERTANIAN	4	6	3	4	4	4
PERKEBUNAN	4	6	5	7	4	4
KEHUTANAN	4	6	5	5	4	6

RATA - RATA STAKEHOLDER	SOSIAL		EKONOMI		LINGKUNGAN	
	-	+	-	+	-	+
PERTAMBANGAN	4.67	4.67	4.67	7.00	6.67	3.33
PERTANIAN	2.67	6.33	2.33	4.67	3.00	5.00
PERKEBUNAN	4.67	4.67	5.00	6.00	5.00	3.67
KEHUTANAN	3.67	4.33	5.00	5.67	5.00	5.33

CALCULATION OF AHP

STAKE HOLDER	(+)	(−)
MASYARAKAT	II	III
PEMERINTAH	III	II
INVESTOR	I	IV
RATA - RATA	I	II

KRITERIA	(+)	(−)
SOSIAL	I	II
EKONOMI	I	II
LINGKUNGAN	IV	II
RATA - RATA	II	III

- In the miningpriority located in critical lands that are not favorable outcome or impact(-).

- In priority agricultural land located in the critical gain a favorable outcome or impact (+). And priority of which is located in agriculture RTRW obtain a favorable outcome or impact (+).

- On priority estates located in critical lands, land suitability, and not critical RTRW unfavorable outcome or impact (-).

- In forestry priorities, located in critical lands, land suitability, and not critical RTRW obtain a favorable outcome (+).

CONCLUSION

AHP method can be applied in spatial planning to produce a better spatial Plan do:

- Presenting the results of calculations of several alternative scenarios based on social criteria, and considering the economic and environmental preferences of all stake holders.

- Allows to generate RTRW by considering preferences of all stake holders and to optimize land use to be economically optimal, in the use of sustainable and socially equitable.

THANK YOU

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