

Land-use & Land cover Changes during Regional Decentralization Policy Implementation: Study Case at Halimun National Park, Indonesia

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INTRODUCTION

Decentralization or Regional autonomy was directed to achieve better management of forest, natural resources and environment, however, in some developing countries the result is in the form of higher deforestation and natural resources degradation such as in Tanzania (Banana, 2007), Kenya (Ongugo, 2004), and some part of Vietnam (Vien, Quang & Tanh, 2005). In Indonesia the decentralization policy is implemented since 2001, after took two years for transition period (1999-2000). In The beginning of the implementation of regional autonomy forest conflict highly increased have been reported. There are 359 cases of conflict between 1997-2003 and 153 cases occurred in 2000 (Wulan *et al.* 2004). There are many explanation behind the conflict, namely unresolved forest area border conflicts, economical crisis which leads to poverty, law uncertainty during the transition period of regional decentralization, and limited capability of the forest area administration institution. Result of the above problems is deforestation and natural resources degradation. The objective of the study is to study land use and land cover changes within National Park for period before and after regional decentralization. Hopefully, it will contribute to the understanding of the underlying process of deforestation.

METHOD

a. Location

Halimun Salak National Park is situated in West Java and Banten Provinces. Geographically situated in 106°12'58'' – 106°45'50'' longitude east and 06°32'14'' – 06°55'12'' latitude south. It is the habitat of some endangered species such Javan Eagle and many species of mammals. The area is also the important place for water resources supply of Metropolitan Jakarta and Bogor. When the park was established in 1992, it cover 40 000 ha, but in 2003 the area was enlarged to be 113.357 Ha, included some production forest area of Perhutani (State owned forest company).

b. Material

Timeseries Landsat image from 1983 – 2004 were used and detail acquisition date is presented in Table 1.

c. Data Processing

In order to reduce seasonal variability all images were radiometrically normalized based on clearest image in 1997 after geo-corrected. We applied *normalized radiometric* based on *pseudoinvariant feature* (PIF) (Yang and Lo, 2000) . After radiometricallt normalized,

all the images were topographically normalized using Non-Lambertian Model (*Minnaert function*) (Smith and Ranson, 1980). The images processing flow is presented in Fig.1.

Table 1. Landsat data acquisition

(1). 14 July 1983	(6). 19 September 1993	(11). 27 August 1999
(2). 6 July 1989	(7). 22 September 1994	(12). 22 December 2001
(3). 11 September 1990	(8). 5 June 1995	(13). 29 April 2002
(4). 25 May 1991	(9). 28 July 1997	(14). 10 January 2003
(5). 27 May 1992	(10). 16 August 1998	(15). 23 July 2004

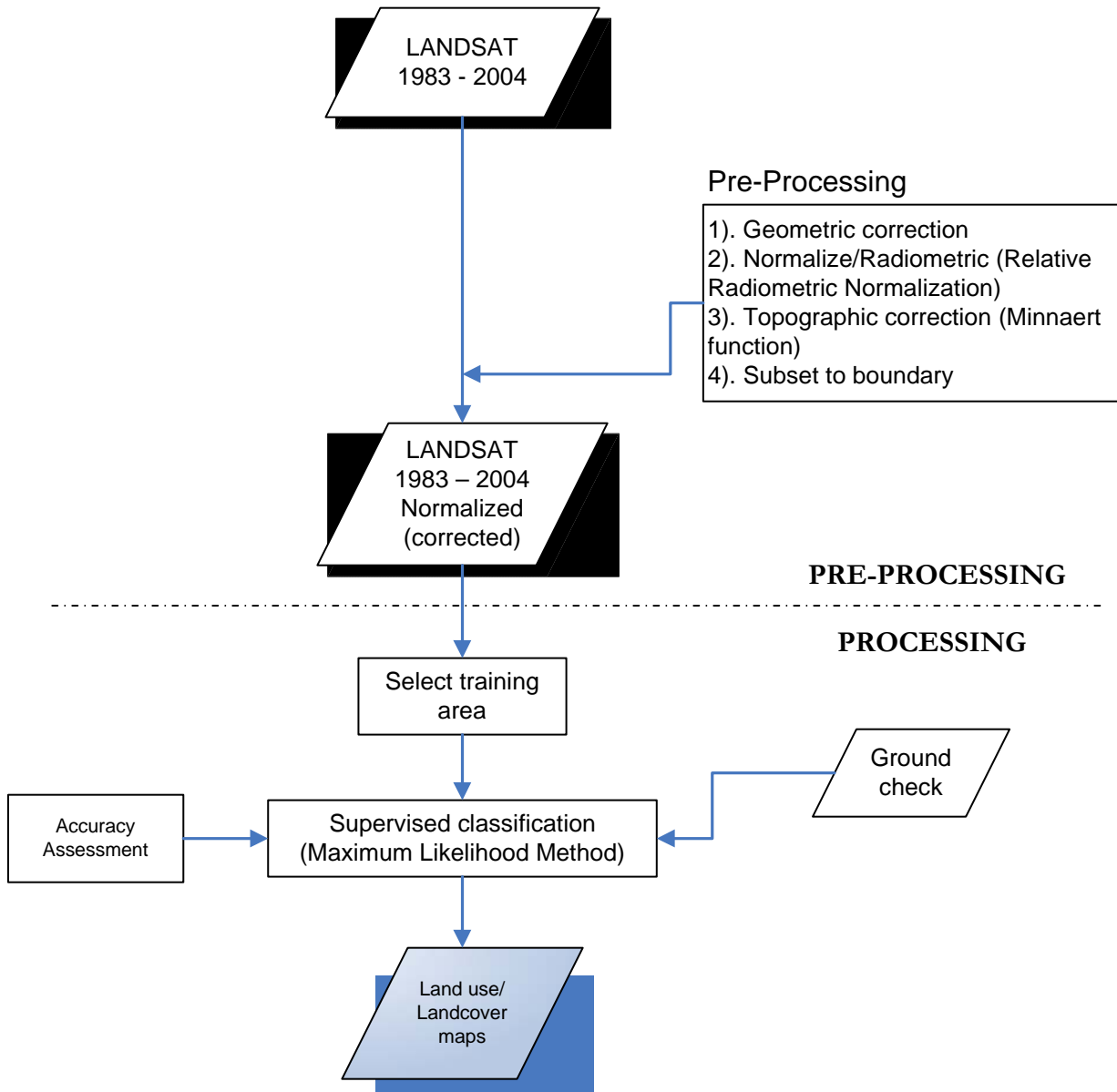


Fig. 1. Flow chart of Landsat data processing

d. Landcover classification

Landsat were classified into land use/land cover by applying supervised classification with *maximum likelihood classification*. The Land use/land cover is divide into 13 class included cloud and shade which are grouped into no data class. The type of land use/cover are natural forest, plantation forest, mixed garden, tea plantation, rubber plantation, bush, grassland, paddy field, upland, bareland, built up area, surface water and no data.

RESULT & DISCUSSION

a. Deforestation

During period 1989 – 2004, natural forest is gradually decrease, meanwhile the plantation forest is relatively stable (Fig.2). Detailed statistic of land use/cover every year is presented in Table Attachment 1.

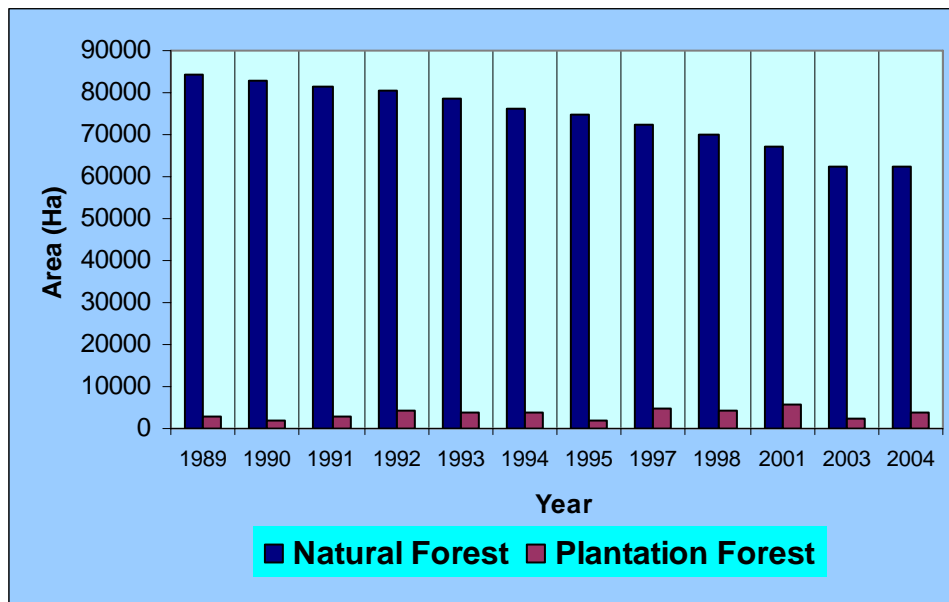


Fig.2. Natural and plantation forest area changes

Paddy and Upland agricultural was fluctuated, meanwhile bush and settlement increasing. It is clear evidence that the encroachment into the National Park is due to log demand not for plantation expansion (Fig. 2). In case of settlement, it is due to the fact that before National Park was established, some inhabitants have been occupying villages. Such kind condition is found also in the other conservation areas (Yamauchi, 2005).

If the land use/cover class were re-classified into forest (natural and plantation) and non forest class (plantation, agricultural, settlement and bare land), it showed the process of deforestation and the increase of non forest class. Further analysis clarified that the highest deforestation rate was occurred in 1997-1998, when the economics crisis

hit the East Asian Countries. This fact is accordance with Sunderlin (1999) and Sunderlin *et al.* (2000). He found that two-thirds of the people in forested areas have become worse off during the crisis compared with their situation in the year before the crisis. The other finding is that small farmers are increasingly interested in clearing forests for perennial tree crops rather than raising food crops in shifting cultivation systems.

Compare to condition before decentralization period, rate of deforestation during the transition of decentralization is lower. After decentralization in the period 2001-2003, the deforestation rate is the third highest. It is probably related to the enlargement of the National Park, whereas, some areas of production forest of PT.Perhutani (State owned forest company) was given to the National Park. The additional deforestation came from the exploitation of the production forest during the period of transition from Perhutani to National Park (Table 2).

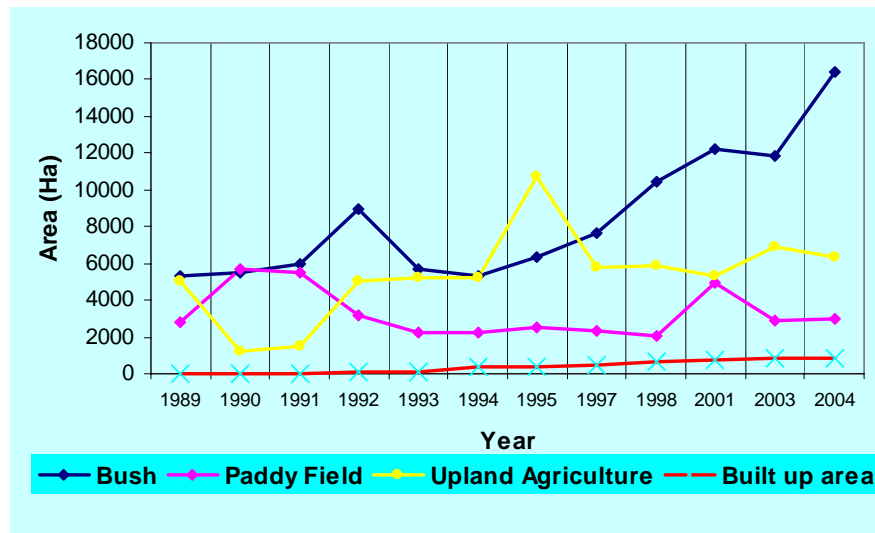


Fig.3. Non forest area changes

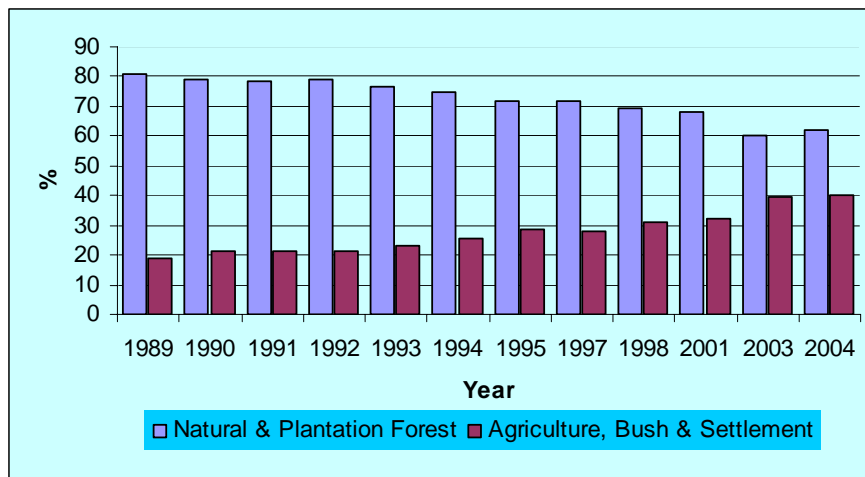


Fig.4. Natural and plantation forest and agricultural area changes

Table 2. Annual rate of deforestation

No.	Periode	Annual Deforestasi (ha/year)	Description
1	1989-1990	1287.8	Before decentralization
2	1990-1991	1297.8	Before decentralization
3	1991-1992	1217.3	Before decentralization
4	1992-1993	1743.6	Before decentralization
5	1993-1994	2363.7	Before decentralization
6	1994-1995	1360.5	Before decentralization
7	1995-1997	1386.5	Before decentralization
8	1997-1998	2638.6	Economics Crisis
9	1998-2001	1039.1	Transition period
10	2001-2003	2183.9	After Decentralization/ Enlargement of National Park
11	2003-2004	975.5	Decentralization

CONCLUSSION

Deforestation in Halimun National Park has been occurring since 1989. There were gradual increase of settlement and non forested land such as bush, upland, paddy field and settlement. The highest rate of deforestation is during the economics crisis. Relation between deforestation and decentralization is unclear.

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Table Attach 1. Landuse and Land cover changes during 1989 - 2004

No	Klas Landcover	Area (Ha)											
		1989	1990	1991	1992	1993	1994	1995	1997	1998	2001	2003	2004
1	Hutan	84,066.4	82,778.6	81,480.8	80,263.5	78,520.0	76,156.3	74,795.8	72,336.2	69,923.3	67,100.0	62,537.9	62,480.3
2	Hutan tanaman	2,934.1	1,788.3	3,020.6	4,417.7	4,037.8	4,019.0	2,133.1	4,748.3	4,209.8	5,726.0	2,305.7	3,986.3
3	Kebun campuran	3,198.2	4,639.4	6,109.7	756.0	3,698.6	5,265.0	6,867.7	4,654.7	4,742.3	6,365.7	9,634.7	4,708.6
4	Kebun karet	2,194.3	4,098.1	2,243.3	2,365.8	6,125.4	5,678.4	1,594.4	5,930.1	6,163.2	2,743.8	4,591.8	5,531.4
5	Kebun teh	322.6	672.3	651.5	991.4	605.1	898.5	1,366.6	1,301.8	1,207.3	788.9	2,611.6	2,649.0
6	Semak	5,328.3	5,503.4	5,941.2	8,994.0	5,697.2	5,312.8	6,300.2	7,648.3	10,428.9	12,199.3	11,835.5	16,386.0
7	Rumput	1,311.5	467.6	569.3	799.5	605.6	1,018.4	228.3	947.6	964.8	972.8	590.6	824.8
8	Sawah	2,781.7	5,687.1	5,538.3	3,203.6	2,260.2	2,243.1	2,534.9	2,308.6	2,062.8	4,945.1	2,895.4	2,958.8
9	Ladang	5,000.0	1,214.4	1,453.5	5,051.8	5,247.2	5,246.7	10,706.9	5,746.3	5,830.4	5,299.7	6,905.4	6,365.9
10	Lahan kosong	217.0	497.0	324.5	456.8	464.9	1,205.8	497.3	1,295.9	1,204.4	477.5	2,620.7	586.8
11	Lahan terbangun	16.6	25.7	39.8	64.1	94.7	332.4	349.6	448.6	614.5	754.3	844.7	874.8
12	Badan air	9.8	8.6	7.8	16.0	23.6	3.7	4.9	12.7	26.5	4.9	4.0	25.4
13	No data	0.8	0.8	0.9	1.0	1.1	1.1	1.5	2.2	2.2	2.2	2.2	2.2
	Total	107,381.2	107,381.2	107,381.2	107,381.2	107,381.2	107,381.2	107,381.2	107,381.2	107,380.3	107,380.3	107,380.2	107,380.2