ORIGINAL RESEARCH PAPER

Engineering

THE ROLE OF THE LOWEST LOCAL AUTHORITY AND SOCIETY (VILLAGE) AS THE MAIN ACTOR IN WATERSHED CONSERVATION.

KEY WORDS: Watershed, land use, conservation

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ABSTRACT

Continues deterioration of watershed shows that top-down watershed rehabilitation and conservation program was ineffective. New approach has to be introduced by distributing some responsibility and authority to smallest administrative unit (village authority).

Comparison 2011 land cover/use map and 2015 Map which Produce by The Directorate General of Environmental and Forestry Planning, Ministry Of Environmental and Forestry shows that significant land use change asspecially in upstream area. Although the primary forest area have been decrease, the total green cover area (primary forest, secondary forest, and production forest) were increase.

Engagement local authority and society (village) will increase effectiveness of watershed rehabilitation and conservation program. The success of The Agro Forestry Program launch by The Ministry Of Environmental and Forestry, as an example, can be seen from the increase of production forest area, and the decrease of both bushes and bare land area.

1 Introduction

Most developing countries faced with continue deterioration of watershed. The deterioration seems to be increase due to ineffective rehabilitation and conservation program which planed and execute by central government. With minimum control, and minimum local community participation, most conservation program end up with minimum result. Based on their study, Nuddin et.al (2007) conclude that to equalize vision and mission across territory and increase farmer knowledge and skills are two priority activities in critical land management.

Cisangkuy watershed is part of Bandung Regency area. Cisangkuy River becomes a strategic river for its surrounding. The river roles as the main water source for the city of Bandung and its surroundings, as raw water source for drinking water, irrigation, as well as for electricity generation. With this situation, conserving the watershed is essential for maintaining water supply. On other hand, within part of watershed, the increase human activities such as industries, agriculture, and housing are growing fast, which require more land, which in turn will decrease the capacity of water supply. To compromise between the land requirement for human activities and the needs to conserve water resources, a good and effective watershed management is required. Effective tools such as Geographic Information System (GIS) and remote sensing method can be used to show the current condition of land use so that any changes in land use can be easily located and monitored. Base on those information gathered from GIS, the local authority (village) can directly take an action. Therefore engagement of local (village) authority combined with the use of good tools such as GIS and remote sensing is necessity.

2 Methods

2.1 Research Location

The research was done in Cisangkuy watershed with a total catchment area of 35 Km^2. As seen in Figure 1. the watershed is administratively located in Badung Regency, West Java Province, Indonesia. The Cisangkuy River flows from south to north, with at total length of 47.5 Kilometer, has 35 tributary.

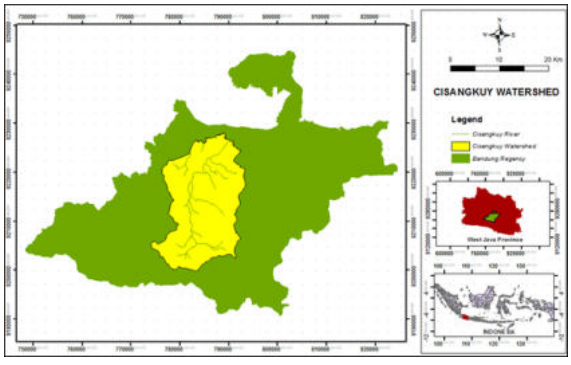

Figure 1. Research Location

2.2 Satellite Data

Over the last decade, the satellite image is widely used as a detection method which provides detailed information for detecting and monitoring changes in land use - land cover (LULC). Time series of remote sensing data can be used for detection of the LULC changes (Coppin et al., 2004). In this research, land used changes was analyzed from land cover/use map produce by The Directorate General of Environmental and Forestry Planning, Ministry Of Environmental and Forestry.

Land use change was obtained by comparing 2011 land cover map with 2015 map. Both maps were compared in term of land use classes and the area of each land-use class. Further analysis was conducted on the spatial distribution of land use changes so that patterns of land use changes can be describe more detail which finally can be used to formulate mitigation strategy.

3 Result

Base on 2011 land use map, 11 classes of land use have been identified within study area, whereas the 2015 map shows only 10 classes. As shown in Figure 2., "Bare Land" which identified in 2011 map was not found in 2015 and changed to "Plantation".

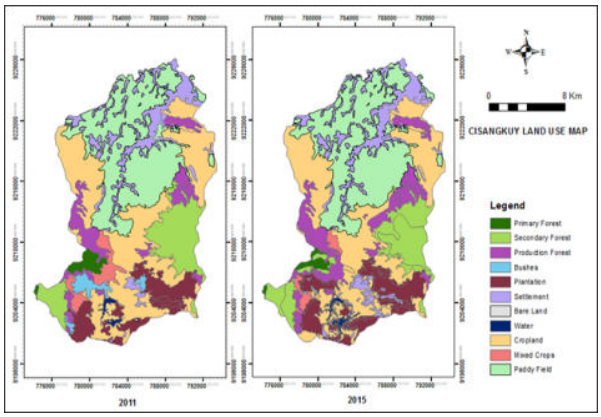

Figure 2. Cisangkuy Land Use 2011 - 2015

Table 1. Cisangkuy Watershed Land Use (2011 – 20015)

Land Use	2011 (Ha)	2015 (Ha)	Land Use Change (Ha)
Primary Forest	592.8	361.5	-231.3
Secondary Forest	3877.1	3999.8	122.7
Production Forest	2488.2	3649.7	1161.5
Bushes	671.2	28.4	-642.2
Plantation	2970.4	3541.1	570.7
Settlement	3423.0	4027.3	604.3
Bare Land	10.2	-	- 10.2
Water	189.3	122.0	- 67.3
Cropland	10057.0	9745.2	- 831.8
Mixed Crop	999.8	470.7	- 529.1
Paddy Field	9462.8	9316.1	- 146.7

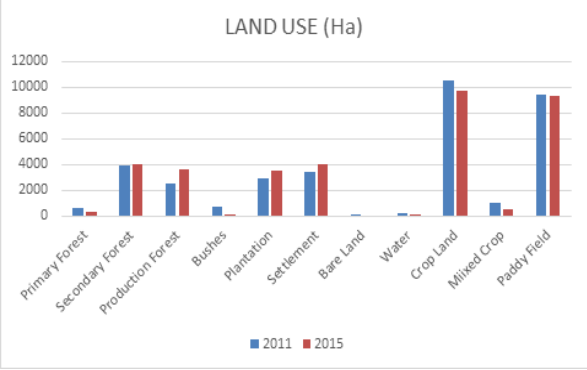

Figure 3. Cisangkuy Watershed Land Use (2011 – 2015)

During period of 2011 to 2015, significant land use change have happen. As shown in Table 1. and Fugure 3. the area of some land use classes, such as primary forest, bushes, bare land, water, cropland, mixed crop, and paddy field, have been decrease. As a balance, the area of secondary forest, production forest, plantation, and settlement were increased. Although the total area of primary forest have been decreased, the total green area (primary forest, secondary forest, and production forest) were increase.

As shown in Figure 4., base on location of land use change, it can be seen that most of land use change occur in up stream area, whereas in downstream area the land use changes are scattered. In down stream area it was found that most land use were change from paddy field to settlement, secondary forest to production forest, cropland to production forest, and small portion of cropland to settlement. In up stream area quite large of primary forest has been change to secondary forest. It can also be noted that settlement in upstream area were grown significantly

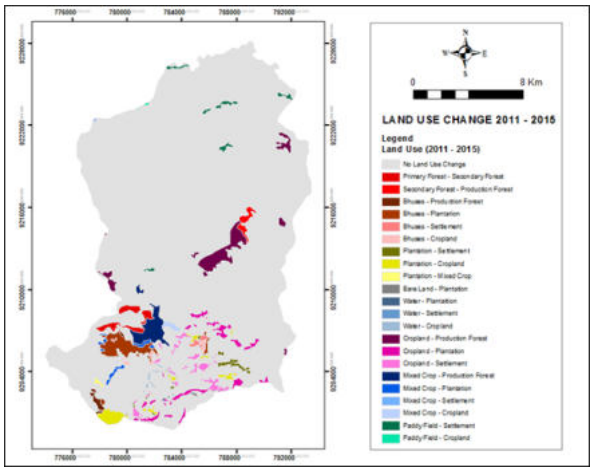

Figure 4. Distribution of Land Use Change 2011 – 2015

4 Discussion

The down stream area of Cisangkuy is very closed with urban area where more land are required for housing, and agriculture activity. The 2011 land use of down stream area is mainly paddy field, it can be seen that in the year 2015 more paddy field have been changed to settlement. It also can be noted that due to the increase of land for housing, the price of the land have been rise so that some private land have been sold to investors (developers) and turn it into housing. To maintain the carrying capacity of down stream area a better land use planning have to be arranged. Proportional allocation for each activity should be arranged (area and location). Land use change in down stream area is difficult to controlled because most of down stream area are private land, Clear regulation and land use permit should be implemented and monitored, at this point more role have to be given to Local (Village).

In Upper stream area where most area are owned by government, theoretically land use change is easier to controlled, but since the location are remote, ground checking is rarely done and land use change is rarely reported, the things was not always happen. In reality it can be seen that the land use change in upstream area were more significant than it was in down stream area. Although some positive land use change were identified such as the change from bare land to plantation, bushes to production forest, and bushes to plantation, the significant land use change to settlement have tobe tighly monitored. In this situation, the role of local authority can be involved as leading unit so that any land use change can be reported and followed up. Local authority can recruit local residents as ranger/supervisor.

Starting 2014, the Ministry of Environment and Forestry launch the community programs calls Community Agro Forestry. The program aimed to encourage local people to intercrop forest crops (pine, fir, teak, etc.), with annual crops (coffee) and perennials crops (beans, corn, ginger), on their land, so that they still get the benefit from their land without disturbing the environmental carrying capacity. Incentive was given by the ministry to local community in form of, technical training, tools, seed, and fertilizer. To increase the effectiveness of the coordination between government and farmers, group of farmers have been establish in each village, and all facilities are directly given to the groups. While the leader and village officer act as supervisors. The success of this program can be seen from the the increase of production forest area, and the decrease of both bushes and bare land.

5 Conclusion

The Land Cover/Use Map produce by The Directorate General of Environmental and Forestry Planning, Ministry Of Environmental and Forestry can be used as a good tools to analyze land use change.

Involvement of villager and village authority will increase the

effectiveness of watershed rehabilitation and conservation. The role of village authority is to coordinate and monitor the agroforestry program, and conduct counseling to local residents concerning the importance of watershed conservation.

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