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# A new C & I for sustainable forest management

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**Abstract.** According to the biophysical area, the government has set the land use of forest areas to be managed for specific management purposes. The implication is that the Criteria and Indicators (C&I) of sustainable forest management are arranged fractionally, based on the forest area's function. This study aims to analyze the effectiveness of the application of C&I for sustainable forest management in conservation forests in the upstream area of the Jeneberang watershed in Gowa Regency. Field observations, interviews, focus group discussions, workshops, and documentation study conducted to collect primary and secondary data. The analysis conducted by the research were (1) Socio-Economic, (2) Landscape Change, (3) Activity-Based Management and (4) Policy Analysis. The results found the application of C&I of sustainable forest management based on forest function is ineffective because the forest area is an inseparable landscape unit, so the management unit should not be separated. Therefore, forest areas' land use should be reconstructed based on the function of forest area (fractional) to "landscape-based watershed landscape". C & I in measuring sustainable forest management performance should also be hierarchically structured interconnected input, outputs, outcomes, and impact indicators.

## 1. Introduction

Forests in Indonesia are organized based on unit forest production management, management practices for protected forests and conservation forest management unit. The reordering is differentiating management practices and implementing these practices in production forests, protected forests and conservation forests. With different purposes, forest management implies the formulation of the concept criteria and indicators (C & I) for sustainable forest management. C & I sustainable forest production management, C & I sustainable management practices for protected Forest and C & I sustainable conservation forest management unit. Each of the C & I focus solely on the achievement of sustainable forest management on one particular product, according to the management objectives of function in each management area.

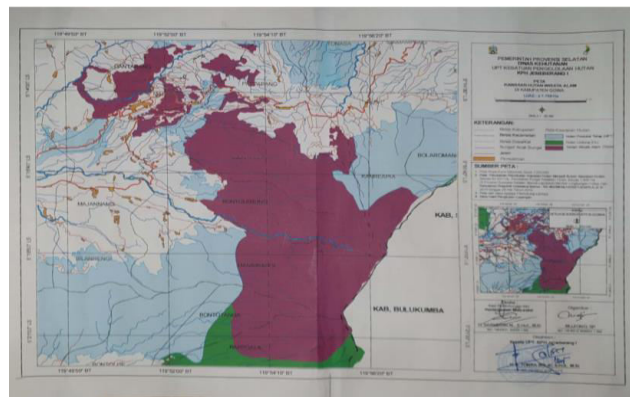
Meanwhile, facts on the ground indicate that forests production, protected forests and conservation forests are an integral part of the landscape and inseparable from upstream to downstream of the watershed. Furthermore, sustainable forest production management, protected forests and conservation areas are interrelated as a whole ecosystem basin. On that basis, there should be production forests, protected forests and conservation areas managed as a unit of integrated management, not a unit of fragmented management. Management of production forests, protected forests and conservation areas as a unified, integrated management unit require a new C & I that differs from the C & I of Sustainable forest management. This is a separate management unit divided into several stands or parts and based on forest area function.



## 2. Materials and Method

### 2.1. Fieldwork

The research was conducted in a conservation forest with a large of area 7.232,591 ha, spread in sub-district: Parigi, Tinggi Moncong, Bonto Lempangan, Tompobulu, Tombolo Pao in Gowa Regency, South Sulawesi, Eastern Indonesia (Figure 1). In each sub-district will be chosen a purposive one village that meets the criteria, namely, a conservation forest area used by sectors and/or having the potential benefits of environmental services utilized by the sectors downstream.



**Figure 1.** Map of sampling site

### 2.2. Data analysis

Primary data were obtained through field observations, in-depth interviews, and Focus Group Discussion (FGD). At the same time, secondary data obtained through the study of documentation. We used the GIS Analyze, Activity Based Management, and Social-economy analysis to analyze the sectors that form land use in the landscape conservation forest area. Meanwhile, analysing conservation forest management's effectivity was used policy analysis and 3P (Planet, Profit, and People) analysis.

## 3. Result and discussion

### 3.1. Review criteria and indicator for sustainable forest management

Review Criteria and Indicators (C & I) for sustainable forest management aim to analyze the structure and scope of C & I that exist. Formulation the C & I that reviewed were results of the study comes from research institutions and government policies, including:

- a. C & I management practices for protected forests was a results study from the Government of West Java Province in collaboration with the School of Biological Sciences and Technology ITB, in order embodiment as Green Province of West Java [1]
- b. C & I for REDD + Safeguards Information System in Indonesia by the Center for Standardization and Environment, Secretariat General, Ministry of Forestry (2013). [2]
- c. C & I Sustainable forest production management, associated with climate change, can play a role in the reduction or mitigation of greenhouse gas emission targets in Indonesia [3]
- d. C & I of sustainable forest management in forest areas managed by the community as common goods [4]
- e. C & I Community-Based Ecotourism Management and Conservation [5]
- f. C & I Social Forestry Schemes Management [6]
- g. C & I Assessment of forest product management performance in IUPHHK-HTI [6]
- h. C & I Assessment of forest product management performance in IUPHHK-HTI [7]

- i. C & I management practices for protected forests was a results study from the Government of West Java Province in collaboration with the School of Biological Sciences and Technology ITB, in order embodiment as Green Province of West Java [8]

*3.2 Review from the result several documents C & I mentioned above concluded some of the following:*

- a. C & I sustainable forest management were reviewed, not structured by elements of forest management prescriptions (i.e. forest governance, a set of technical activities of forest management and harvesting). Still, it is structured based on the biophysical and socio-economic aspect. This led C & I was reviewed can not measure each element of forest management prescriptions' sustainability and relevance based on the sustainability of forest management indicators.
- b. C & I for sustainable forest management reviewed were not structured/detailed according to the planning criteria, and performance indicators are indicators of inputs, outputs, outcome and impact indicators. This led C & I for sustainable forest management to systematically describe the structure and hierarchical relationship between indicators of inputs, outputs, outcome, and impact indicators in measuring sustainable forest management performance. Therefore, C & I, there is no traceable link between the indicator with other indicators as a hierarchical unity in achieving the ultimate goal is creating forest management product integrity of the forest ecosystem services and increased social welfare.
- c. C & I for sustainable forest management that were reviewed based on the unit of management of forest areas by function thereby building the C & I of sustainable management in production forest, K & I management of sustainable forest reserve, C & I of sustainable management of forest conservation, and C & I sustainable management of the forest area managed by the community. The implication is, C & I can only describe the particular product sustainability of forest management according to the function of the forest area. Meanwhile, the ground shows that the forest area with a particular function (production forest, protected forest, or forest conservation) is an integral part of the landscape (landscape). It should not be a separate management unit. The forest areas are also an integral part of the landscape, with areas outside forests in the upstream, midstream, and downstream watershed region, either directly adjacent or not directly adjacent to the forest area. Therefore, forest management's sustainability is interrelated and integrated with the area's sustainability outside the forest area, so management must also be unity.
- d. C & I implementation of sustainable forest management based on its functions is inefficient and ineffective, thus allowing more than one management organization in a forest landscape. For example, forests in the upstream jeneberang watershed in Gowa, there are two organizations managing forest areas, namely: (1) UPTD KPHP Jeneberang 1, which manages forest production management unit and protected forests, and (2) UPT BKSDA, which manages conservation forest management unit, Indicators of sustainability forest in both the forest management unit are different, but these are in the same forest landscape and the value of the economic benefits as the outcome and impact of landscape management of the forest area heading to the same area it is midstream watershed and downstream Jeneberang watershed.
- e. C & I sustainable forest management are qualitative dominant reviewed were. Thus, it's hard to measure when implemented in the field. Therefore, the C & I of sustainable forest management tends to be a vision of forest management, not into the goal of forest management.
- f. C & I sustainable forest management were reviewed significant dominant oriented to the achievement of rehabilitation of the sustainable forest management soil and water conservation (pro-planet) than the management objective to generate economic benefit value (pro-profit) to the parties and the empowerment of local communities (pro-people). C & I

sustainable forest management should include and integrate into proportion achieving the goals of rehabilitation and conservation (pro-planet), the value of the economic benefits for the parties (pro-profit), and community empowerment (pro-people).

### 3.3 Gap analysis

Gap Analysis was performed to assess the gap between forest resources' actual performance management and expected ideal performance. The data on Actual performance were analyzed from field observations, stakeholder interviews, focus group results, and research results during the workshop. While the ideal performance, refer to the review results in some existing C & I at this time. This gap analysis will be the basis to develop and find the "new" C & I sustainable forest management. A brief description of the results of the gap analysis is presented in Table 1.

**Table 1.** Results of gap analysis of sustainable forest management

Analysis of Gap				
Focus of Analysis	Desired Forest Management Performance	Actual Conditions	Gap Identification	Action plan
Forest Area	Forest area shows no changed	Conversion of forest areas into residential land, rice fields, fish ponds and gardens	The large size of the forest area on the map is different from the forest area in the field	Providing broad legal access to local communities and stakeholders who manages forest resources
	The forest area is organized into block management units and management plots	Forest area arranged into functions of conservation forests, protected forests and production forests	The community does not know the boundaries of production forest areas, protected forests, and conservation forests.	Reforming forest area into the river basin management units and tenement blocks as the basis of planning mem forest products, timber, non-timber forest products and environmental services
	The parties recognize the forest area	There are tenurial conflicts over forest areas with local communities and stakeholders	Overlapping forest land tenure	Providing broad legal access to local communities and stakeholders managing forest resources

Forest Cover	The vegetation of primary forest and secondary forest	Vegetated primary forest, secondary forest, mixed garden shrubs, paddy, horticulture crops, fish ponds, ex- field	There are forest areas that are not forest vegetation	Arranging and integrating each forest area land use unit as a single watershed landscape
Forest Rehabilitation	Plant various types of trees that produce wood, non-timber, and environmental services	Plant several types of trees that produce wood and fruit	Gap types of non-timber producing rehabilitation plants, including food	Managing forest rehabilitation with agroforestry patterns in each land use unit of forest areas
Forest Utilization	Utilization for the production of various forest products in the form of wood, non-timber, and environmental services, according to the function of the forest area	Utilization of land for the production of non-timber forest products, food crops, horticulture, and environmental services in all forest areas	Forest utilization for food crops and horticultural crops in all forest areas	Arranging and integrating each forest area land use unit as an integrated watershed landscape
	Legal forest use through a permit mechanism	Some forest use is legal and partly is illegal	There are illegal activities in the forest area	Providing broad legal access to local communities and stakeholders managing forest resources
Forest Product Production	Timber-non-timber forest products and environmental services planned	Unplanned production of timber, non-timber (including food) forest products and environmental services	There is no planning for the production of various forest products on a cycle / rotating basis	Arrange a production calendar for various forest products in a rotation for each land use unit

Economic Benefits of Forest Resources	The total economic benefit value of forest products for communities in the upstream, midstream and downstream watershed as the basis for calculating the contribution of the forestry sector to the economy of the watershed area.	Forests are assessed based on the outcome of each forest utilization business unit, not based on the aggregate value of forest product production inputs, thus the environmental service value of forest resources (impact ) is not calculated as its contribution to the economy in watershed area.	The value of economic benefits from externality in the downstream area is not counted as an integral part of the functional benefit value of forest areas in the upstream and midstream of the watershed area. This implies that the contribution of the economic value of forest resources is considered low (under valuation)	The value of total economic benefits from a watershed area as the basis for determining the value of economic benefits from forest resources
Forest Management Organization	One management organization for all forest areas in the watershed area	Forest area function-based organization, namely UPT KSDA for conservation forests and UPT KPHP Jeneberang 1 for production forests and protection forests	There are more than one organization forest management in a landscape basin , creating inefficiency management	Landscape management in basin area with the paradigm of "one plan, one management"
Policy	Various kinds of government and local government regulations are implemented	Various kinds of government and local government regulations have not been implemented	Regulations to local / non-formal institutions are more internalized than the formal institutional rules of the government and local governments	collaboration development between formal government institutions and local community non-formal institutions
	Forest area management based on the function of forest areas to produce one primary product and various other	Forest area conversion to meet the land needs of sectors through revision of district spatial planning	Forest management for the purpose of multiple production of a variety of forest products (multiple use forest management) on all units of land use of landscape	Landscape-based forest management to the production of various forest products in all land use in the landscape basin

	forest products as secondary products		watershed	
	Empowerment of communities to manage forest areas through the Social Forestry scheme	Communities use forest areas illegally to produce plantation and horticultural crops	Public access to manage forests through social forestry schemes are low	Providing broad legal access to local communities and stakeholders managing forest resources
Social Society	The forest area is recognized by the local community and stakeholders	Land tenure conflicts in forest areas with local communities and stakeholders	Forest areas are not clear and clean, especially for local communities	Providing broad legal access to local communiti es and parties managing forest resources
	Forest areas provide employment for local communities	Unemployment of the local community is high	Communities have not been empowered to manage forest resources	Providing broad legal access to local communities and stakeholders to manage the forest resources

### 3.4 New criteria and indicators for sustainable forest management

The results of the reviews on C & I for sustainable forest management and the results of the Gap Analysis between the actual performance of forest management with the ideal performance expected (according to K & I), the basis of arguments and scientific justification to build "C & I" following the theory of prescriptive management forests and forest management issues in the field. C & I for sustainable forest management of the "new" named **"Criteria and Indicators for Sustainable Forest Management based landscape unit areas in the watershed."**

A new C & I are intended briefly described as follows: based on the unit of management of forest areas by function,

- a. C & I are not based by function on the unit of forest assessment. However, based on the landscape of the watershed area. The functions of the forest area used as a landscape mosaic that sustainability management is considered to be separate from the units mosaic function other forest areas adjacent to that unit mosaic of forest production functions, units mosaic forest protection functions, units mosaic forest conservation function, as well as units mosaic areas outside the forest area directly adjacent to the forest area and or become part of the landscape mosaic Watershed region. Therefore, C & I shifting the base unit of sustainability forest assessment of **"function-based forest area"** to **"landscape-based on watershed areas."**
- b. C & I are structured linkages indicators of inputs, outputs, outcome, and impact indicators on measuring sustainable forest management performance hierarchically.
- c. An new C & I create a balance management purposes, namely, the management objective of rehabilitation and conservation (pro-planet), destination management generate value economic benefits for local communities and stakeholders (pro-profit), and objectives of management empowerment of local communities (pro-people) that include: the distribution

of legal access for the local community and the parties manage forest resources, income generation, equitable income distribution, employment creation, poverty reduction and regional development of forest villages. Structure of C & I in detail can be seen in Table 2.

**Table 2.** New criteria and indicators for sustainable forest management based landscape management unit areas in the watershed

No.	Aspect	Principle	Criteria	Indicator
1	Sustainability of Forest Management <i>Inputs</i>	Fair land use distribution for local communities and stakeholders	Fair land use distribution for stakeholders	Local communities and parties recognize forest areas and forest area boundaries
		Empowerment of Local Community Workforce	Forest management creates jobs for local communities and watershed areas	There is a scheme for local communities and parties to access forest resources legally Opportunities to do business and work in the forestry sector are always available The local community is the main actor in managing the forest
		Partnership for Multi-Stakeholder Financial Capital Investment	Proportional investment of financial capital of parties in forest management	Communities are willing to invest their financial capital in managing forest resources The business world is willing to invest its financial capital in managing forest resources The Governments and Local Government is willing to invest financial capital to manage forest resources Local communities, businesses, governments, and local governments are willing to partner to invest their financial capital in managing forest resources

2	Sustainability of the Operational / Technical Process of Forest Management	Arrangement the forest areas as landscape	Adaptive Forestry Arrangement with existing land use, but compromise with the landscape (landscape) of the watershed area	Macro forest management of forest areas in the form of management blocks
				Integrated micro / compartment forest management with local community land use arrangements and land use arrangements for watershed areas Mapping of micro forest boundaries
		Flexibility forest output management (multiple use forest management)	Management of various forest product enterprises that are mutually compatible and responsive to crises	A data base on the potential of various forest products that is always up to date
				Planning activities of the annual production of various forest products (including food) for a period of at least 2 rotation
				Preparation of Production Activity Plan Documents (production calendar) for Timber, Non-Timber Forest Products (including food) and Environmental Services in a rotating manner
				Local communities and facilitated parties obtain legal access rights to utilize forest areas according to the available schemes
		Forest Rehabilitation	RHL is pro-poor, pro-job, and pro-environment	Forest rehabilitation and land with agroforestry system-based land use and/or landscape base in watershed

				Forests Rehabilitation and land with productive plant species, economically, ecologically and socio-cultural associated with local communities and watershed area
3	Sustainability of Forest Output Management	Producing Multiple Outputs	Flexibility and Output Aggregation	<p>There is a micro forest layout map</p> <p>There is a permanent artificial boundary pal and/or natural boundary to mark the boundaries of the micro forest arrangement</p> <p>The local community and the parties have legal access rights to use the forest area according to the available scheme</p> <p>Forestry enterprises are the main source of livelihood for local communities</p> <p>There is a production activity plan document (production calendar) for timber, non-timber (including food) forest products and environmental services on a rotating basis</p> <p>Forest Resources Annual Accounts are available</p> <p>The data base for the volume of production of various forest products (including food) refers to sustainable JTT</p> <p>Various rehabilitated plants that have economic, ecological, and socio-cultural associations for the local community and the watershed area</p>

4	Sustainability Outcome	Aggregative Benefits for Rural Areas	Physical productivity	<p>A number of funds invested by the local community, and / or the business world, and / or the government, and / or local governments in forest resource management</p> <p>Utilization of a variety of forest products by local communities and the parties according to the purpose of the of each block management / plot management</p> <p>Utilization of various forest products based on sustainable JTT</p> <p>There are no conflicts over forest use with local communities and stakeholders</p> <p>Establish investment partnerships for local communities, the business world, the government and local governments to manage forest resources</p> <p>The value of economic benefits distributed to local communities, and / or the business world, and / or the government, and / or local governments for forest resource management</p> <p>There are no land claims from other parties (clean &amp; clear)</p> <p>The sectors using the output of forest products and services are managed. For example, managed agriculture because of the availability of water from the forest</p>
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			Developing the economic productivity of local village	Products of various forest products as the main driver of the forest village economy
			Economic Productivity of Developing Watershed Areas	The forestry sector is the leading sector in the watershed area
5	Sustainability Impact of Forest Management	Aggregative Benefits for Watershed Areas	The watershed economy is developing	<p>The input-output value chain for forest goods and services is established</p> <p>Forestry business as a regional base sector for forest villages</p> <p>Unemployment for local people is low</p> <p>The sector of forest ecosystem goods and services users develops in the watershed area</p> <p>Distribution of value-benefit economic that are fair to the local communities and stakeholders in the basin</p> <p>High contribution to the economy in the forestry sector on watershed area</p> <p>Forest resources are managed in a sustainable manner</p> <p>Livelihoods of local communities and watershed areas are quality and sustainable</p> <p>Local community poverty is low</p> <p>No illegal activities occur in forest areas, such as encroachment and illegal logging</p> <p>Minimalize the Ecological disasters</p>

6	Social Sustainability	Social order of forest management	Forest management organizations and institutions	Formal and non-formal forest management organizations and institutions are developed Forest management partnership networks between upstream, midstream, downstream and communities are developed The community is obedient and obedient to formal and non-formal forest management institutions
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#### 4. Conclusion

The application of C&I of sustainable forest management based on forest function is ineffective because it is an inseparable landscape unit, so the management unit should not be separated. Therefore, forest areas' land use should be reconstructed based on forest area (fractional) to "landscape-based watershed landscape". C & I in measuring sustainable forest management performance should also be hierarchically structured interconnected input, outputs, outcomes, and impact indicators.

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