Biodiversity and Climate Change Project (BIOCLIME)

A Framework on Biodiversity Indicators and Parameters for Multipurpose Monitoring System in South Sumatera

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SUMATERA SELATAN

A Framework on Biodiversity Indicators and Parameters for Multipurpose Monitoring System in South Sumatera

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Front Cover (from left to right):

- Meranti Protection Forest (Hendi Sumantri/BIOCLIME)
- Mangrove Forest (Dudy Nugroho/BIOCLIME)
- *Rafflesia arnoldi* (mongabay.com)
- Sumatran Tiger (teknologi.news.viva.co.id)
- Migratory Birds (Teguh Imansyah/Sembilang National Park)

EXECUTIVE SUMMARY

Indonesia is known as a mega diversity country and the nation attention to the conservation of biological diversity is very high. It is stated in the Principal Law of the Republic of Indonesia (UUD 1945) and also is expressed by the Indonesian government's commitment to ratify the Convention on Biological Diversity (CBD) in 1992 at a meeting of the United Nations Conference on Environment and Development (the Rio "Earth Summit") and followed by the assignment of Law No. 5 of 1994 on the Ratification of the United Nations Convention on Biological Diversity. Further, to support the achievement one of the objectives of the CBD, the Law No. 11 in 2013 on the Ratification of the Nagoya Protocol on access to genetic resources and equitable sharing of benefits arising from the balanced and utilization on biodiversity has also been realized. Conservation of biodiversity have been also given special attention in Law No. 41 in 1999 on forestry, in particular specific location has been allocated in the form forest nature reserves, forest conservation, and hunting parks. The allocation of space for the protection of essential ecosystem functions (peat ecosystems, freshwater swamp ecosystem and other protected areas) are also mandated in the Act No. 26 in 2007 on the National Spatial Planning.

In an effort to protect biodiversity and habitat loss and at the same time reducing greenhouse gas emissions (GHG) emissions as global climate change mitigation efforts, the Government of Indonesia has committed to implement the scheme Reducing Emissions from Deforestation and Forest Degradation (REDD+), through avoiding deforestation, reforestation, conservation of forest carbon stock, and sustainable forest management. In order to prevent negative affect in the implementation of REDD+, the government has set Principles, Criteria and Indicators Safeguard for Indonesia (PRISAI), adopted from the 7 principles of the safeguards of the Cancun agreement.

Although the Indonesian government is very committed to protect biodiversity and ecosystems, the loss of biodiversity and habitat (deforestation) continues. Deforestation of Indonesia during 2000 to 2012 amounted to 6.02 million hectares (Margono et al. 2014), and approximately 1/3 of the deforestation occurred in Sumatra island. This have resulted in habitat loss, degradation and fragmentation of habitats, which encourages the extinction of endemic species of Sumatra, including orangutans, Sumatran tigers, and Sumatran elephants. In order to protect and conserve habitat and biodiversity, the parties have agreed to set up strategic plan to protect the ecosystem until 2020, which was formulated at COP 10 of the Convention on Biological Diversity (CBD) in Nagoya, Japan. The plan called the Aichi Target, which contains 20 targets, divide into 5 strategic objectives, namely: (a) Mainstreaming biodiversity in government institutions and society as efforts to suppress loss of biodiversity), (b) Reducing the pressure on biodiversity and promote sustainable use , (c) improving the status of biodiversity by protecting its ecosystems, species and genetic diversity, (d) increase the

biodiversity benefits and services and (e) improving implementation through participatory planning and capacity building.

Fulfillment of Aichi targets in line with the mandate of Indonesian Forestry Law, National Spatial Planning Law and REDD + safeguards. The achievement of the Aichi target requires data and information about the current state of biological diversity as a base line. So it is very urgent to develop a set of indicators and parameters of biodiversity, which is used to monitor periodically the trend of changes of habitat and biodiversity. Local government (province) has a mandate to do most matters relating to the environment and forestry, as outlined in the Act No. 23 in 2014 on Regional Government and Law No.33 in 2004 on Financial Balance between Central and Local Government, and Law no. 41 of Forestry. One of them is to describe the Indonesian Biodiversity Strategy and Action Plan (IBSAP) into strategic programs at the provincial level.

To achieve this goal, GIZ through the Biodiversity and Climate Change (BIOCLIME) will assist the Government of Indonesia to design and implement legal, policy and institutional reforms for biodiversity conservation and sustainable forest management at the local and provincial level in South Sumatra Province. This program not only contributes to the achievement of biodiversity in Indonesia according to the CBD, but also to meet the target of climate change mitigation and adaptation set UNFCCC to reduce greenhouse gas emissions by 2020. In the early stages, GIZ Bioclime sets up a framework biodiversity criteria, indicators and parameters, which are used to monitor habitat and biodiversity trends measurable changes that are conducted periodically in South Sumatra.

The conservation effort/program achievement should be measurable, and therefore development of criteria, indicator and parameter of biodiversity is urgently needed. At the initial stage, the GIZ has assisted the regional government of South Sumatera to formulate frame work on Biodiversity indicator, criteria and parameter for long term and periodical monitoring. Two type of approach have been formulated, namely Landscape Ecological and Driver, Pressure & Response (DPSIR) approach.

Under the Landscape Ecological approach, Criteria and indicators are arranged in tiers (hierarchical approach), from landscape level to community/ecosystem, population-species and genetics, adopting Noss' (2005) approach. Hierarchical approach is also selected to anticipate resource availability, both human resources and funding. In a very constrained condition the most macro criteria and indicator of biodiversity can be chosen, and if possible it can be done for all levels of criteria and indicators. Criteria at the Regional landscape level is the most macro criteria that is easiest and fastest to be monitored, which consists of physical condition, landscape condition (habitat type, Land cover type & Land use type), area status, threat and environmental services (Table 7.1). These indicators further are divided into several parameters.

Criteria of biodiversity at habitat level are the habitat quality and status (Table 7.2). Indicators to assess habitat quality are diversity, species distribution, forest stand condition, including flora and

fauna. The criteria of habitat status are related to the threat indicator of important habitat for target species. The method to obtain such data and information is to conduct field survey (primary data).

Indicators at the level of species and genes include (a) capability of an area in supporting sustainability of a species, (b) occurrence of invasive species, (c) species sustainability, and (d) cultural aspect (Table 7.3)

The second approach is DPSIR. Monitoring of DPSIR is organized to examine Driver and Pressure, and to what extent Response from stakeholders has been given. Table 7.4 shows a fill in form of several drivers and pressures that might happen in various places, based on some information sources/field. Table 7.5 is a form for identifying to what extent the Drivers and Pressures have been responded by Government/manager. It is expected that by analyzing this data stakeholders can monitor and identify various important drivers and pressures as well as formulation of necessary policy intervention/program (response).

Based on the literature study and FGDs, the priority of the program are as follows:

1. Assessment of Policy related to Conservation Biodivesity

a. Biodiversity Conservation Policy Analysis
b. Biodiversity Strategy and Action Plan Making for South Sumatera Province
c. Strategic Environment Assessment and South Sumatera Spatial Planning
d. Parliament Forum Establishment

2. Assessment in Social, Cultural, Economy and Education Program

a. Baseline Survey in Economy, Social, and Cultural of Community Who Can Access the Natural Resources
b. Conflict Mapping between Community and Wildlife Animal, including Community Mitigation and Adaptation Efforts
c. Assessment of Protection Area Encroachment
d. Mainstreaming Biodiversity into Basic Education Curricullum
e. Biodiversity Management Collaboration : Citizen Science and Monitoring Participative System Approach
f. Community-Private Partnership Formation

3. Assessment in Landscape Ecology

a. Analysis of Structure and Landscape Change and Its Impact on Biodiversity
b. Corrridor Development study that Linked the Fragment of Protection/Conservation Area
c. Habitat Vulnerability on Fire and Oil and Gas Exploitation Accident
d. Mapping the Suitability Habitat for Tiger and Elephant
e. Environmental Service Assessment with focusing on Provider of Water and Carbon

4. Study in Habitat Level Program

a. The Habitat Qualities (Density, Age/Size Distribution) in Fragmented Forest
b. Mapping the Location Distribution for Feed and Salt Lick Area of Priority Wildlife

5. Study in Species/Population Level Program

a. Study of Protected Flora and Fauna Population

6. Program Database and Information

a. Database and WEB GIS Management Penyusunan
b. The Biodiversity Collaboration Secretariat Establishment

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ACRONYN AND ABBREVIATION

AFOLU	:	Agriculture Forestry Other Land Use
AMDAL	:	Environmental Impact Analysis
BAPI	:	Biodiversity Action Plan for Indonesia
BKSDA	:	Natural Resources Conservation Unit
BIOCLIME	:	Biodiversity and Climate Change
BMKG	:	Meteorology Climatology and Geophysics Agency
BPS	:	BPS-Statistics Indonesia
CA	:	Nature Reserve
CBD	:	Convention on Biological Diversity
COP	:	Conference of the Parties
CPO	:	Crude Palm Oil
CSR	:	Corporate Social Responsibility
DPSIR	:	Driver-Pressure- State-Impact-Response
DPRD	:	Regional People's Representative Council
EEA	:	European Environmental Agency
FAO	:	Food and Agriculture Organization of The United Nations
FGD	:	Focussed Group Disscusion
FPIC	:	Free, Prior and Informed Consent
GMO	:	Gene Modified Organism
GIZ	:	The Deutsche Gesellschaft für Internationale Zusammenarbeit
GRK	:	Greenhouse Gas
HTI	:	Industrial Plant Forest
IBSAP	:	Indonesian Biodiversity Strategy and Action Plan
IUPHHK	:	Business Permit for Timber Forest Product Utilization
KLH	:	Ministry of the Environment
KLHS	:	Environmental Strategic Assessment
KPA	:	Nature Conservation Area
KPH	:	Forest Management Unit
KSA	:	Sanctuary Reserve Area
LIPI	:	Indonesian Intitute of Sciences
LSM	:	Non Government Organization
MODEF	:	Monitoring of Deforestation
MODIS	:	Moderate-Resolution Imaging Spectroradiometer
MRV	:	Monitoring Reporting and Verification

NALEM	:	National Level Land-Based Emission Monitoring
NAPEM	:	National Level Peat Emission Monitoring
NBSAPs	:	National Biodiversity Strategies and Action Plans
NOAA	:	National Oceanic and Atmospheric Administration
OECD	:	Organisation for Economic Co-operation and Development
PBB	:	United Nations
PHBM	:	Forest Community Based Management
PRISAI	:	Indonesian Safeguard Principle Criteria and Indicator
RAN-GRK	:	National Action Plan for Greenhouse Gas Emissions Reduction
REDD+	:	Reducing Emissions from Deforestation and Forest Degradation including reforestation, fores carbon stock conservation and sustainable management of forest
RTRWP/K	:	Regional (Province/District) Spatial Planning
RTR	:	Spatial Planning
SALEM	:	Sub-National Level Land-Based Emission Monitoring
SAPEM	:	Sub-National Level Peat Emission Monitoring
SDM	:	Human Resources
SKPD	:	Regional Government Management Units
SIG	:	Geography Information Systems
SM	:	Wildlife Sanctuary
TN	:	National Park
TNKS	:	Kerinci Seblat National Park
TNS	:	Sembilang National Park
TWA	:	Nature Recreation Park
UNFCCC	:	United Nations Framework Convention on Climate Change
UU	:	Act

GLOSARY

AFOLU	:	Refers to Agriculture, Forestry and Other Land Use is a new term that published in the guideline of IPCC 2006 including LULUCF scheme (Land Use, Land Use Change, and Forestry), by adding agriculture issues
Cancun Agreement	:	A set of significant decisions by the international community to address the long-term challenge of climate change collectively and comprehensively over time and to take concrete action for accelerating the global response
CA	:	A protected area of importance for wildlife, flora, fauna or features of geological or other special interest, which is reserved and managed for conservation and to provide special opportunities for study or research
COP	:	The highest decisions making unit in an international convention. Each country that has ratified the convention has their delegation in COP. COP held annually or bi-annually. COP's agenda consists of monitoring the implementation of the decisions and law instrument and decisions making to achieve the convention implementation effectively, including institutional and administrative rules
CSR	:	A management concept that the private company evolve to integrate social and environmental awareness into business operational management and interaction with others stakeholder
Deforestasi	:	Deforestation is defined as a long-term/permanently land cover changes from forested land to non forested land, including for estate crops, settlement, industrial area, etc. On the annexes of Protocol Kyoto (COP UNFCCC) deforestation refers to forest land use change into other non-forest land use by man. FAO stated that deforestation is forest land use change to others land use or forest cover decreasing below the minimum standard value 10 % for long term. Additionally, FAO set the minimum of tree height (FAO: 5 m in situ) and minimum area (FAO: 0,5 ha) and stated that agriculture is not a dominated land use. Each country has different definition of minimum forest cover, height and area
DPSIR	:	Drivers-Pressures-States-Impacts-Responses is a causal framework to link the connection of community and environment
FPIC	:	Free, Prior and Informed Consent is an international development approach based on local community rights, especially customary law, to strengthen the community participation in decision making on various issue related to local and customary community

Indikator	:	The indicator is a measure , generally quantitative , which can be used to describe and communicate the complex phenomena simply , including trends and progress regularly
KLHS	:	A set of systematically, holistic and participatory analysis in order to ensure that the principles of sustainable development has become a basic and integrated into regional development or policy, planning and program
Konservasi in-situ	:	On-site conservation or the conservation of genetic resources, species, in natural ecosystem
Konservasi ex-situ	:	Out-site conservation or the conservation of genetic resources, species, in a artificial ecosystem
KPA	:	A Nature Conservation area shall be a specific terrestrial or aquatic area whose main function are to serve life support system and preserve diversity of plant and animal species. As well as to provide a sustainable utilization of living resources and their ecosystems
KPH	:	Forest Management Unit is the smallest management unit which is feasible to maintain efficiently and sustainably
KSA	:	A Sanctuary Reserve Area shall be a specific terrestrial or aquatic area having specific criteria for preserving biodiversity plant and animal as well as ecosystem, which also serve as life support system
MODEF	:	An approach for monitoring deforestation by using low satellite resolution (MODIS atau NOAA)
NALEM	:	A measurement and monitoring system of dry land national emission by using high satellite resolution, usually held in twice a year
NAPEM	:	A measurement and monitoring system of national peat-land emission directly the field, usually held in twice a year
OECD	:	An international forum with the aims to promote policy related to the community economy and social welfare over the world
Parameter	:	A characteristic, image, and measureable factor that can describe a system or an important element to determine or evaluate a project, situation, and trend
PHBM	:	An approach in forest community based management that focus on strengthening the natural resources management system by using collaborative approach that linked village community and other stakeholders in order to achieve the sustainable use

		of natural resources and the enhancement the Human Development Index which is flexible, participatory, and accommodative
PRISAI	:	A set of instruments to achieve the safeguard condition in REDD mechanism
Remote Sensing	:	A method to measure deforestation and forest degradation using tools indirectly e.g. satellite
RAN-GRK	:	A national working plan guideline in order to mainstream the efforts in reducing greenhouse gas directly and indirectly based on national development target
REDD+	:	An international agreement to prevent the climate change by giving compensation mechanism to developing country in protecting the forest
SALEM	:	A measurement and monitoring system of sub-national dry land emission by using high satellite resolution
SAPEM	:	A measurement and monitoring system of sub-national peat-land emission directly the field, usually held in twice a year
SM	:	A protected area, a naturally occurring sanctuary, that provides protection for species from hunting, predation or competition
SKPD	:	A set of regional management unit both in province and district, that consists of regional secretariat, parliament secretariat, government office and regional technically unit. SKPD is a regional executive implementing agency that collaborating each other to support the regional program achievement
UNFCCC	:	An international environmental treaty that was created at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, June, 1992. The aim of the agreement is to stabilize greenhouse gas concentrations in the atmosphere at a minimal level. The treaty is not mandatory agreement and non-legally binding

I. INTRODUCTION

1.1. Background

Indonesia is known as a mega diversity country and the nation attention to the conservation of biological diversity is very high. It is acknowledge in the Law 5 of 1990 on the Conservation of Biodiversity and ecosystem. The foundation of this policy is stated in the Principal Law of the Republic of Indonesia (*UUD 1945*) and its amendment, Article 33 section 3, in which Natural resources) including forest ecosystem, biodiversity) belong to the country and must be utilized for the wealth of Indonesian people.

The Indonesian government's commitment is also seen when ratifying the Convention on Biological Diversity (CBD) in 1992 at a meeting of the United Nations Conference on Environment and Development (the Rio "Earth Summit") and followed by the assignment of Law No. 5 of 1994 on the Ratification of the United Nations Convention on Biological Diversity. To support the achievement one of the objectives of the CBD, the Law No. 11 in 2013 on the Ratification of the Nagoya Protocol on access to genetic resources and equitable sharing of benefits arising from the balanced and utilization on biodiversity has also been realized. Conservation of biodiversity have been also given special attention in Law No. 41 in 1999 on forestry, in particular specific location has been allocated in the form forest nature reserves, forest conservation, and hunting parks. The allocation of space for the protection of essential ecosystem functions (peat ecosystems, freshwater swamp ecosystem and other protected areas) are also mandated in the Act No. 26 in 2007 on the National Spatial Planning.

In an effort to protect biodiversity and habitat loss and at the same time reducing greenhouse gas emissions (GHG) emissions as global climate change mitigation efforts, the Government of Indonesia has committed to implement the scheme Reducing Emissions from Deforestation and Forest Degradation (REDD+), through avoiding deforestation, reforestation, conservation of forest carbon stock, and sustainable forest management. In order to prevent negative affect in the implementation of REDD+, the government has set Principles, Criteria and Indicators Safeguard for Indonesia (PRISAI). The PRISAI contains 10 principles, adopted from the 7 principles of the safeguards of the Cancun Agreement, which was agreed at a meeting of the parties to the 16 (COP16) of the United Nations Framework Convention on Climate Change / UNFCCC in 2012 in Mexico. Principle 6th of PRISAI is supporting biodiversity, protection of natural forests and environmental services.

Although the Indonesian government is very committed to protect biodiversity and ecosystems, the loss of biodiversity and habitat (deforestation) continues. According to Margono *et al.* (2014), Indonesian deforestation in the period 2000 to 2012 amounted to 6.02 million hectares, approximately 1/3 of the deforestation occurred in Sumatra island. In 2000, natural forests in Sumatra is about 16.2 million ha, and in 2012 fell to 13.4 million ha or deforestation has occurred 233 thousand hectares per year. The cause of deforestation of natural forests is agricultural expansion, land grabbing, illegal

logging, forest fires, and others. This activity causes the loss, degradation and fragmentation of habitats, which encourages the extinction of endemic species of Sumatra, including orangutans, Sumatran tigers, and Sumatran elephants.

In order to protect and conserve habitat and biodiversity, the parties have agreed to set up strategic plan to protect the ecosystem until 2020, which was formulated at COP 10 of the Convention on Biological Diversity (CBD) in Nagoya, Japan. The plan called the Aichi Target, which contains 20 targets, divide into 5 strategic objectives, namely: (a) Mainstreaming biodiversity in government institutions and society as efforts to suppress loss of biodiversity), (b) Reducing the pressure on biodiversity and promote sustainable use , (c) improving the status of biodiversity by protecting its ecosystems, species and genetic diversity, (d) increase the biodiversity benefits and services and (e) improving implementation through participatory planning and capacity building.

Fulfillment of Aichi targets in line with the mandate of Indonesian Forestry Law, National Spatial Planning Law and REDD + safeguards. The achievement of the Aichi target requires data and information about the current state of biological diversity as a base line. So it is very urgent to develop a set of indicators and parameters of biodiversity, which is used to monitor periodically the trend of changes of habitat and biodiversity. Local government (province) has a mandate to do most matters relating to the environment and forestry, as outlined in the Act No. 23 in 2014 on Regional Government and Law No.33 in 2004 on Financial Balance between Central and Local Government, and Law no. 41 of Forestry. One of them is to describe the Indonesian Biodiversity Strategy and Action Plan (IBSAP) into strategic programs at the provincial level.

To achieve this goal, GIZ through the Biodiversity and Climate Change (BIOCLIME) will assist the Government of Indonesia to design and implement legal, policy and institutional reforms for biodiversity conservation and sustainable forest management at the local and provincial level in South Sumatra Province. This program not only contributes to the achievement of biodiversity in Indonesia according to the CBD, but also to meet the target of climate change mitigation and adaptation set UNFCCC to reduce greenhouse gas emissions by 2020. In the early stages, GIZ Bioclime sets up a framework (framework) biodiversity indicators and parameters, which are used to monitor habitat and biodiversity trends measurable changes that are conducted periodically in South Sumatra.

1.2. Objective

The objectives of the report is to create a framework formulation biodiversity parameters that will be used in the multi-purpose monitoring system that takes into account spatial planning, conservation, connectivity and sustainable management of forest ecosystems and contribute to biodiversity monitoring in REDD + programs at provincial and national level.

1.3. Activities

a) Identify the necessary activity/program at national and provincial levels for monitoring and reporting of biodiversity
b) Defining the contents of the strategy and action plan for biodiversity at the national and sub-national (provincial)
c) Defining measures, methods and techniques for monitoring biodiversity in South Sumatra
d) Identify the likely source of data for monitoring biodiversity in South Sumatra
e) Designing matrix biodiversity monitoring for forest ecosystems including participatory monitoring (which includes the scope, indicators, measurement, data sources, techniques and equipment)
f) Designing an indicator framework by considering Response, Pressure, Benefit & State, especially pay attention to the cause (Driver) loss of habitat and biodiversity, and forest fires.

II. METHOD

2.1. Development Process

The development of document on framework of indicators and parameters of biodiversity monitoring is participative through Focused Group Discussion / FGD. The process begins with the study of literature from a variety of sources including international conventions, regulations, books, reports, papers/ scientific papers published in journals to determine the framework approach (approach) (Figure 2.1).

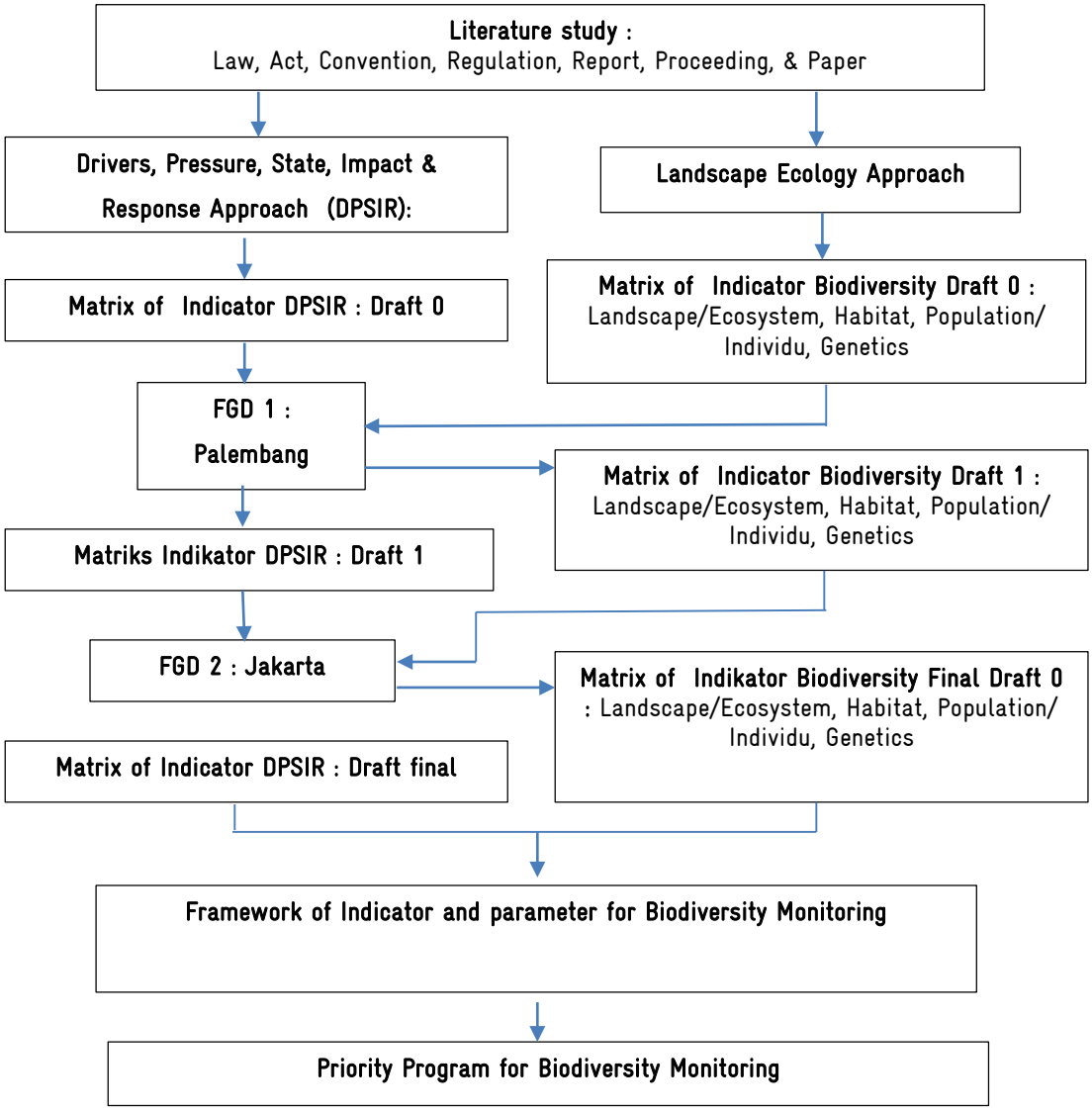

Figure 2.1. Flowchart the development of Framework of Indicator and parameter for Biodiversity Monitoring

From the above process two approaches was produced, namely Landscape Ecology (Landscape Ecology) and Drivers, Pressure, State, Impact and Response (DPSIR) approach. Based on these two approaches Draft 0 matrix of indicators and parameters of biodiversity monitoring was constructed. The next process was to collect input from relevant institutions (stakeholders) such as NGOs, private sector, and the Local Government Unit / SKPDs through FGD 1st at provincial level (in Palembang). Based on the first FGD, the Draft 0 was refined into Draft 1 and it was presented in the second FGD in Jakarta to be reviewed by participants from universities, researchers from the Indonesian Institute of Sciences / LIPI), the Ministry of Forestry, and Non-Governmental Organization (NGO). The revised Draft 1 (Final Draft) was used as an input for priority program development.

2.2. Report Structure

The report was prepared in two parts. The first part, namely Chapter III, Chapter IV and Chapter V, describes the results of a study of the literature related to the following terms. (a) the environmental conditions of South Sumatra Province, (b) Conservation of biodiversity and its context with the laws and conventions, (c) Define the content of the action plans and strategies for biodiversity at national level and sub-national (provincial). The second part of the report, namely Chapter VI and Chapter VII summarizes the report related to the activities (a) Design a biodiversity monitoring matrix for forest ecosystems including participatory monitoring (which includes the scope, indicators, measurement, data sources, techniques and equipment), (b) Defining the measurement , methods and techniques for monitoring biodiversity in South Sumatra, (c) Identify possible sources of data for monitoring biodiversity in South Sumatra, (d) Designing indicator framework by considering Response, Pressure, Benefit & State, especially pay attention to the cause (Driver) loss of habitat and biodiversity, and forest fires.

REPORT PART 1

III. Environmental Condition of South Sumatera Provinces

IV. Biodiversity Conservation and Its Context with Legislation and Convention

V. Definition of Content Sub-National Biodiversity Strategy and Action Plans based on National Biodiversity Strategies and Action Plans (NBSAPs)

III. ENVIRONMENTAL CONDITION OF SOUTH SUMATERA

3.1. Geographics Condition

South Sumatra is one of the ten provinces in Sumatra island, located between 1 ° -4 ° south latitude and 102 ° -106 ° East Longitude (BPS Sumsel 2014). Administratively, the Province adjacent with the province of Jambi province in the north, the province of Lampung in the south, the province of Bangka Belitung in the east and Bengkulu province in the west. Most areas in South Sumatra Province are located in the lowlands, in which many rivers flowing, consisted 54 main river, 287 sub-rivers, 908 sub-sub rivers and 1,723 branches of the river (www.sumselprov.go.id) (MOE 2012).

3.2. Climate

South Sumatra province has a wet climate and situated at the boundary between the monsoonal pattern that is characterized by a single peak periods of rain and equatorial pattern characterized by two peak periods of rain (MOE 2012). In 2013, BPS South Sumatra (2014) reported an average rainfall reached 281.7 mm, the average air temperature between 26-27oC, the intensity of rainfall between 86 mm-613 mm, and the number of rainy days reached 238 days. Driest days in July while the wettest day in January.

3.3. Topography

The landscape of South Sumatra affected by Bukit Barisan mountain range forming hills in southwest and valleys in the southern part of the region. Most of the area is under 100 m (asl) the sea level and flat (Figure 3.1 and 3.2). The hilly area ranging from 900 m-1200 m above sea level. The mountain range of Bukit Barisan have some mountain peaks, namely Mount Dempo (3,159 m), Mount Bungkuk (2,125 m), Mount Seminung (1,964 m), and Mount Patah (1,107 m) (MoF 2013).

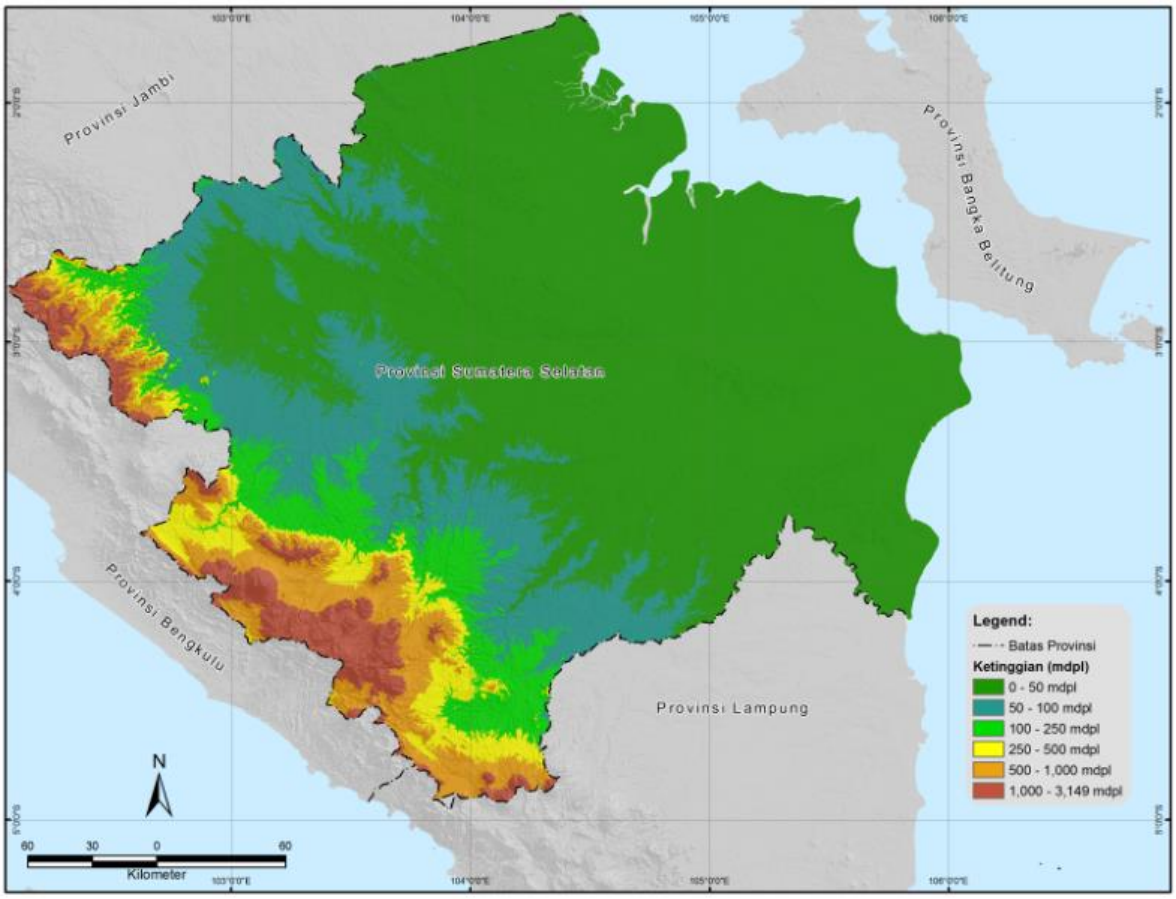

Figure 3.1. Distribution of elevation class Sumatera Selatan Province

3.4. Area and Its Status

Based on the Provincial Spatial Plan in 1994 (RTRWP), total area of South Sumatra Province about 10.9254 million hectares, of which one third is forest area (4,255,843 ha). Based on the Decree of the Minister of Forestry 76 / Kpts-II / 2001 dated March 15, 2001, the forest area in South Sumatra province is 4 416 837 hectares, meanwhile the area of forest state land area reached 4,399,837 hectares. However, area of state forest area has undergone a change. Based on the up dated designation of forest area map in 2012, the state forest area of South Sumatra Province of about 3 670 957 hectares (Alikodra *et al.* 2013). Detail classification of state forest land are as follows:

1. Forest Conservation (NAC / KSA): 792 907 ha

   a) Wildlife: 267 772 ha
   b) National Parks: 466 060 ha
   c) Natural Park: 223 Ha
   d) Forest Park: 607 Ha
   e) Water Conservation Area: 58 245 ha

2. Protection Forest : 591 832 ha

3. Production Forests: 2,286,218 ha

a) Limited Production Forest: 236 893 ha
b) Permanent Production Forests: 1,688,445 ha
c) Convertible forest: 360 881 ha

Overall, the largest forest area is located in the district Banyuasin (39%) (Table 3.1).

After the island of Java, Sumatra's forests has undergone high pressure from a variety of pressure including the expansion of agricultural land and plantations, unsustainable forest exploitation, mining exploitation, illegal logging, transmigration, and population growth (Damayanti, et al. 2015) . This causes a low percentage of forest cover, which is only 11% (Table 3.2). In 2000, there were approximately 1.06 million ha of natural forest and in 2012 fell to 0.942 million ha, or a decrease of about 9,780 ha per year. The decline is more common in swamp forest, while the upland and mangrove forests are relatively fixed, especially since 2009. In contrast since 2009, plantation area has increased quite large (Figure 3.3). Spatial distribution is presented in Figure 3.4.

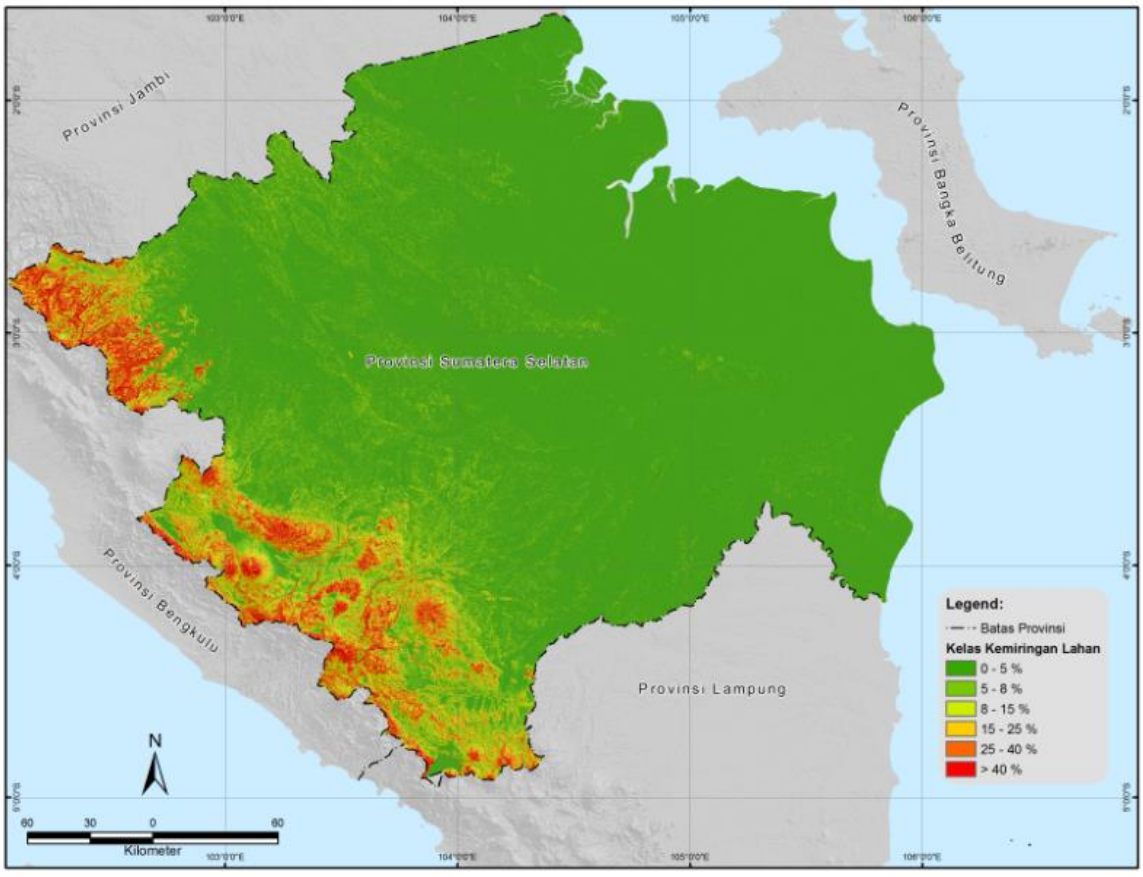

Figure 3.2. Distribution of Slope of Sumatera Selatan Province

Table 3.1. Forest State Land of Sumatera Selatan Province

Kabupaten/ Kota	Luas Wilayah (Ha)	Luas Kawasan Hutan (Ha)										Jumlah penetapan KPH
		Hutan Konservasi	%	Hutan Lindung	%	Hutan Produksi	%	Hutan Produksi Konversi	%	Total	%	
Banyuasin	1.210.421	290.821	24	69.043	6	72.166	6	44.805	4	476.836	39	2
Empat Lawang	230.431	3.759	2	65.913	29	7.825	3	-	-	77.497	34	2
Lahat	447.562	52.261	12	48.642	11	32.093	7	-	-	132.995	30	1
Muara Enim	880.086	8.938	1	62.774	7	198.083	23	72.527	8	342.322	39	1
Musi Banyuasin	1.450.225	69.353	5	19.596	1	507.752	35	113.338	8	710.039	49	2
Musi Rawas dan Musi Rawas Utara*	1.268.494	37.812	3	1.767	0	325.281	26	34.224	3	399.085	31	2
Ogan hilir	226.653	-	-	-	-	-	-	4.666	2	4.666	2	0
Ogan Komering Ilir	1.703.713	15.306	1	103.206	6	661.829	39	90.235	5	870.576	51	4
Ogan Komering Ulu	366.357	-	-	68.047	19	73.181	20	-	-	141.228	39	1
Oku Selatan	463.774	44.826	10	126.771	27	28.317	6	-	-	199.915	43	4
Oku Timur	335.859	-	-	-	-	19.478	6	-	-	19.478	6	0
Lubuklinggu	32.489	4.238	13	260	1	1.175	4	-	-	5.674	17	0
Pagar Alam	64.288	-	-	25.869	40	-	-	-	-	25.869	40	1
Palembang	36.736	50	0	-	-	-	-	-	-	50	0	0
Prambulih	45.716	-	-	-	-	1.069	2	1.163	3	2.232	5	0
Prov. Sumsel	**8.762.805**	**527.364**	**6**	**591.889**	**7**	**1.928.251**	**22**	**360.958**	**4**	**3.408.463**	**39**	**4**

(Source: Alikodra *et al.* 2013) *Keterangan : * data before kabupaten expansion*

South Sumatra has ten conservation areas that are not connected to each other spatially. This area includes (1) Sembilang National Park (TNS), (2) the Kerinci National Park (TNKS), (3) Wildlife Reserve Bentayan (SM Bentayan), (4) Wildlife Reserve Dangku (SM Dangku), (5) Asylum wildlife Gumai Pasemah (SM Gumai Pasemah), (6) wildlife Gunung Raya (SM Gunung Raya), (7) Wildlife Reserve Isau-isau Pasemah (SM Isau-isau Pasemah), (8) Wildlife Reserve Padang Sugihan (SM Padang Sugihan), (9) Recreation Park Punti Kayu (TWA Punti Kayu), and (10) Nature Reserve Bungan Maskikin (CA Bungan Maskikin).

Table 3.2. Forest Cover with regard to Forest Function in Sumatera Selatan Province

District/ Municipality	Area (Ha)	Conservation Area				Fixed Forest Area					Production Forest	Non Forest Area	Grand Total	%
		Nature Reserve	National Park	Sub Total	%	Protected Forest	Limited Production Forest	Production Forest	Sub Total	%				
Banyuasin	1.210.421	46	121.081	121.127	10	41.217	-	29.225	70.442	6	23	18.691	210.282	17
Empat Lawang	230.431	1.592	-	1.592	1	21.615	1.928	146	23.690	10	-	3.429	28.711	12
Lahat	447.562	27.768	-	27.768	6	20.583	337	-	20.920	5	-	29.959	78.646	18
Muara Enim	880.086	5.520	-	5.520	1	42.627	831	1.189	44.647	5	4	1.854	52.026	6
Musi Banyuasin	1.450.225	499	765	1.264	0	810	12.732	102.820	116.362	8	3.175	13.229	134.029	9
Musi Rawas dan Musi Rawas Utara*	1.268.494	-	16.414	16.414	1	-	16.799	3.700	20.500	2	83	209.654	245.651	19
Ogan hilir	226.653	-	-	-	-	-	-	-	-	-	-	710	710	0.3
Ogan Komering Ilir	1.703.713	-	-	-	-	19.442	-	36.646	56.088	3	472	10.656	67.217	4
Ogan Komering Ulu	366.357	-	-	-	-	27.208	1.415	7.370	35.993	10	-	14.317	50.310	14
Oku Selatan	463.774	7.628	-	7.628	2	54.703	-	-	54.703	12	-	17.884	80.216	17
Oku Timur	335.859	-	-	-	-	-	-	4.573	4.573	1	-	9.494	14.067	4
Lubuklinggu	32.489	-	-	-	-	-	-	-	-	-	-	-	-	-
Kota Pagar Alam	64.288	-	-	-	-	18.160	-	-	18.160	28	-	89	18.249	28
Kota Palembang	36.736	32	-	32	0	-	-	-	-	-	-	4	36	-
Kota Prambulih	45.716	-	-	-	-	-	-	-	-	-	-	-	-	-
Prov.Sumsel	**8.762.805**	**43.085**	**138.260**	**181.345**	**2**	**246.365**	**34.043**	**185.670**	**466.078**	**5**	**3.757**	**329.970**	**981.148**	**11**

(Sumber: Alikodra *et al.* 2013) Note *: * before expansion to be 2 independent district*

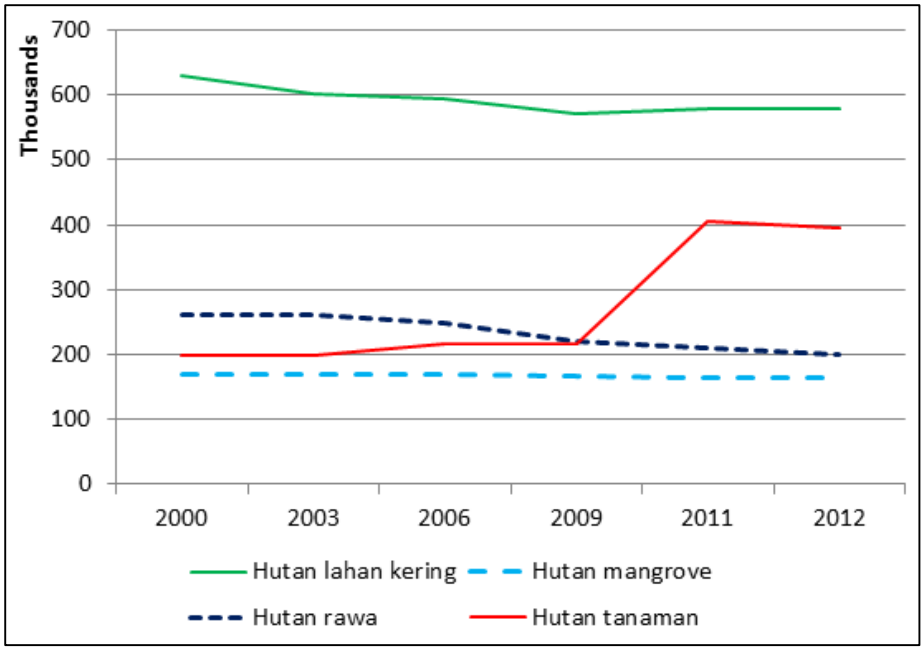

Figure 3.3. Trend of Deforestation in Sumatera Selatan Province (Source: Ditjenplan, result from analysis)

3.5. Critical Land

MoF (2013) reported in 2007, total area of critical land in South Sumatra was 2,824,849 ha, consisting of critical land area of 2,085,364 ha and very critical land area of 739,485 ha. The area of critical land increased significantly in 2011, which reached to 3,668,355 ha, fortunately, the area of very critical land decreased to 217 707 ha.

3.6. Ecosystem Biodiversity

Ecosystem diversity is the diversity of habitats, ecosystems and ecological processes which involve factors of abiotic and biotic (Swingland 2001). Measurement of ecosystem diversity is obtained by measuring abundance and diversity of species. South Sumatra has various types of natural ecosystems include forest ecosystems, wetlands (swamp, peat and mangrove ecosystems), and agricultural land ecosystems (Bappenas 2003; Bappenas 2012, MoF 2013). Forest ecosystems in South Sumatra is strongly influenced by the Bukit Barisan mountain range. This natural phenomenon supports the formation of tropical lowland forest ecosystems (green lowland forest) (20%) through the mountain forest ecosystems (montane forest) (80%) that included in Kerinci Seblat National Park (TNKS). Mangrove ecosystems and wetlands located at protected area of the Sembilang National Park (87,000 ha). Plantation ecosystems represented monoculture agricultural ecosystems, including palm oil plantations and rubber plantations.

3.7. Biodiversity

South Sumatra is home to unique species and high conservation value (MoF 2013). Forest ecosystems in TNKS is home to 4,000 plant species, 350 bird species, and 144 mammal species, including some mammals with rare status (endangered) such as the Sumatran tiger (*Panthera tigris sumatrae*), Sumatra Asian elephant (*Elephas maximus sumatranus*), rabbit Sumatra (*Nesolagus netscheri*), small Sumatran rhino (*Dicerorhinus sumatrensis*), clouded leopard (*Neofelis nebulosa*), and Malayan tapir (*Tapirus indicus*).

Wetlands and mangrove ecosystems is habitat for many species of water birds including migratory birds (Siberian migrant bird), birds dowitcher Asia (*Limnodromus semipalmatus*), birds Greenshank (*Pseudototanus guttifer*), eastern white bird pelican (*Pelecanus onocrotalus*), milky stork (*Mycteria cinerea*), heron lesser adjutant (*Leptoptilos javanicus*), black and white bird-winged tern (*Chlidonias leucoptera*). In addition there is also a saltwater crocodile (*Crocodylus porosus*), freshwater dolphins (*Orcaella brevirostris*), the giant freshwater turtle (*Chitra indica*), gibbon (*Hylobates syndactylus syndactylus*), golden cat (*Catopuma temminckii temminckii*), Sambar deer (*Cervus unicolor equinus*), bears (*Helarctos malayanus*), Sumatran tiger (*Panthera tigris sumatrae*), Sumatra Asian elephant (*Elephas maximus sumatranus*), Malayan tapir (*Tapirus indicus*), and 249 species of fish include fish Sembilang (*Plotusus canius*) which is a fish endemic in South Sumatra and fish belida (Chitala lopis) which is also used as the logo of the province. As for vegetation, a wide variety of terrestrial and aquatic plant life in wetlands include nail elephant (*Acrostichum aureum*), palm (*Nypa fruticans*), Sea pine (*Casuarina equisetifolia*), pandan (*Pandanus tectorius*), sea hibiscus (*Hibiscus tiliaceus*), nibung (*Oncosperma tigillaria*), jelutung (Jelutong), Kempas (*Koompassia excelsa*), Gelam (*Syzygium inophylla*), *Rhizophora sp, Sonneratia alba* and *Bruguiera Gimnorrhiza*.

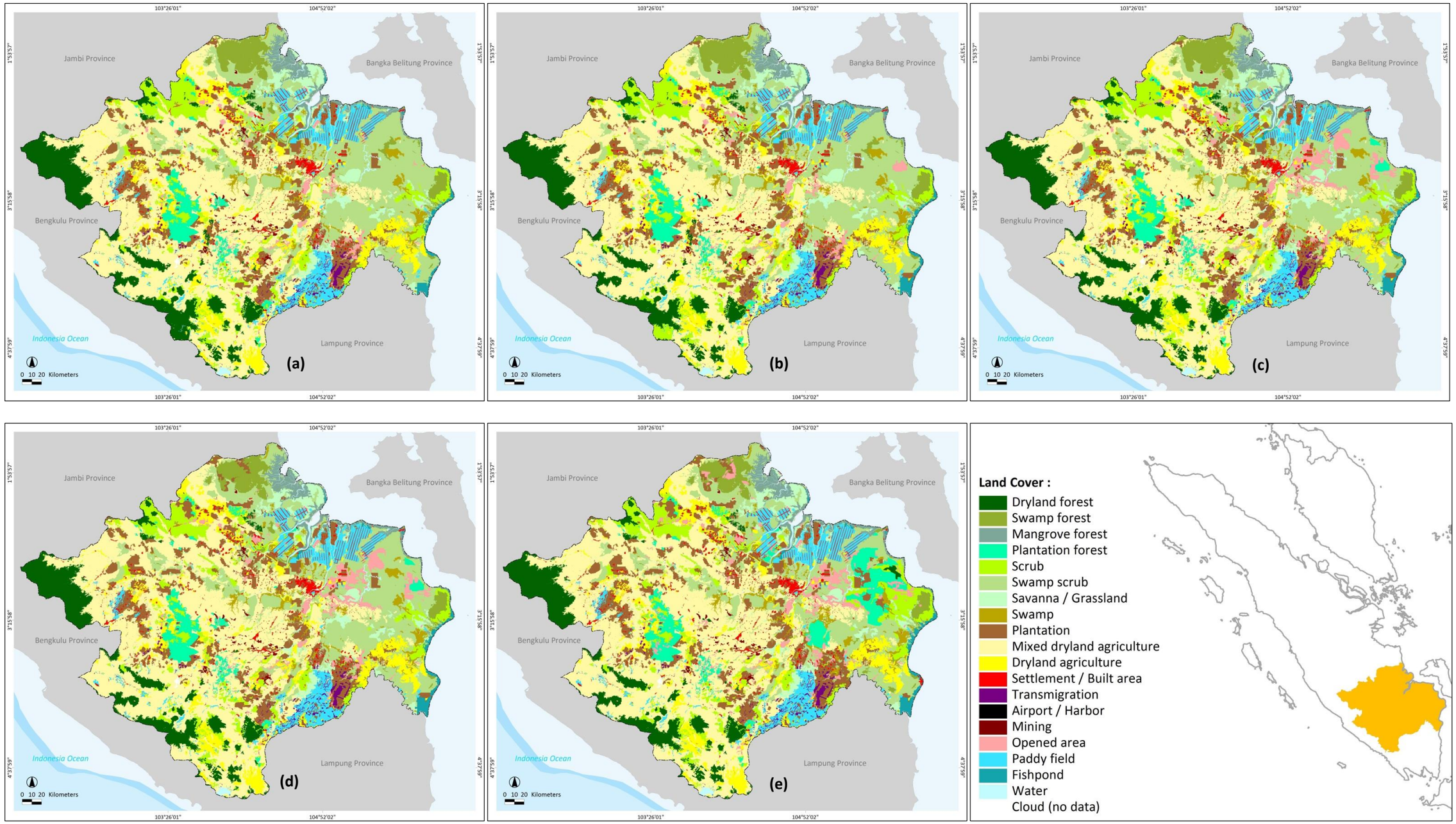

Figure 3.4. Land cover of South Sumatra Province in (a) 2000 (b) 2003 (c) 2006 (d) 2009 and (e) 2012

IV. BIODIVERSITY CONSERVATION AND ITS CONTEXT WITH LEGISLATION AND CONVENTION

The context of biodiversity conservation with laws and conventions need to be understood. This is important because the participation of state in signing the convention and its ratification in form of laws lead to consequences that must be implemented, so that things that should be done either at the national or provincial levels can be identified. Several important conventions/protocols include Convention on Biodiversity/CBD, Nagoya Protocol, Aichi Biodiversity Targets, Ramsar Convention and Reducing Emissions from Deforestation and Forest Degradation/REDD).

4.1. Convention on Biodiversity (CBD)

Convention on Biological Diversity (CBD) was signed by 150 leaders of countries in 1992 at the United Nations Conference on Environment and Development (the Rio "Earth Summit"). Indonesia has ratified the CBD and defined by Act No. 5 of 1994 on the Ratification of the United Nations Convention on Biological Diversity. CBD is a world community's recognition of the value of biodiversity and its function in the process of evolution and its function in maintaining the life support system on earth. The ratification of the CBD is also caused by the important role of biodiversity in socio-economic and culture of people as well as concerns over the growing amount of pressure on habitats and biodiversity, which triggered the extinction of species.

In general, the CBD has four main pillars; three pillars are the objectives and one pillar is the strategy for achieving the objectives (Figure 4.1). The three pillars of the CBD objectives are (a) conservation of biodiversity, (b) sustainable use of its components, and (c) fair and balance distribution of benefits arising from utilization of genetic resources, including ensuring access to genetic resources and the transfer of its technology, with regard to all rights over those resources and technologies, and its funding. The fourth pillar is a mainstreaming as a strategy to achieve the objectives through the preparation of National Biodiversity Strategy and Action Plan (NBSAP).

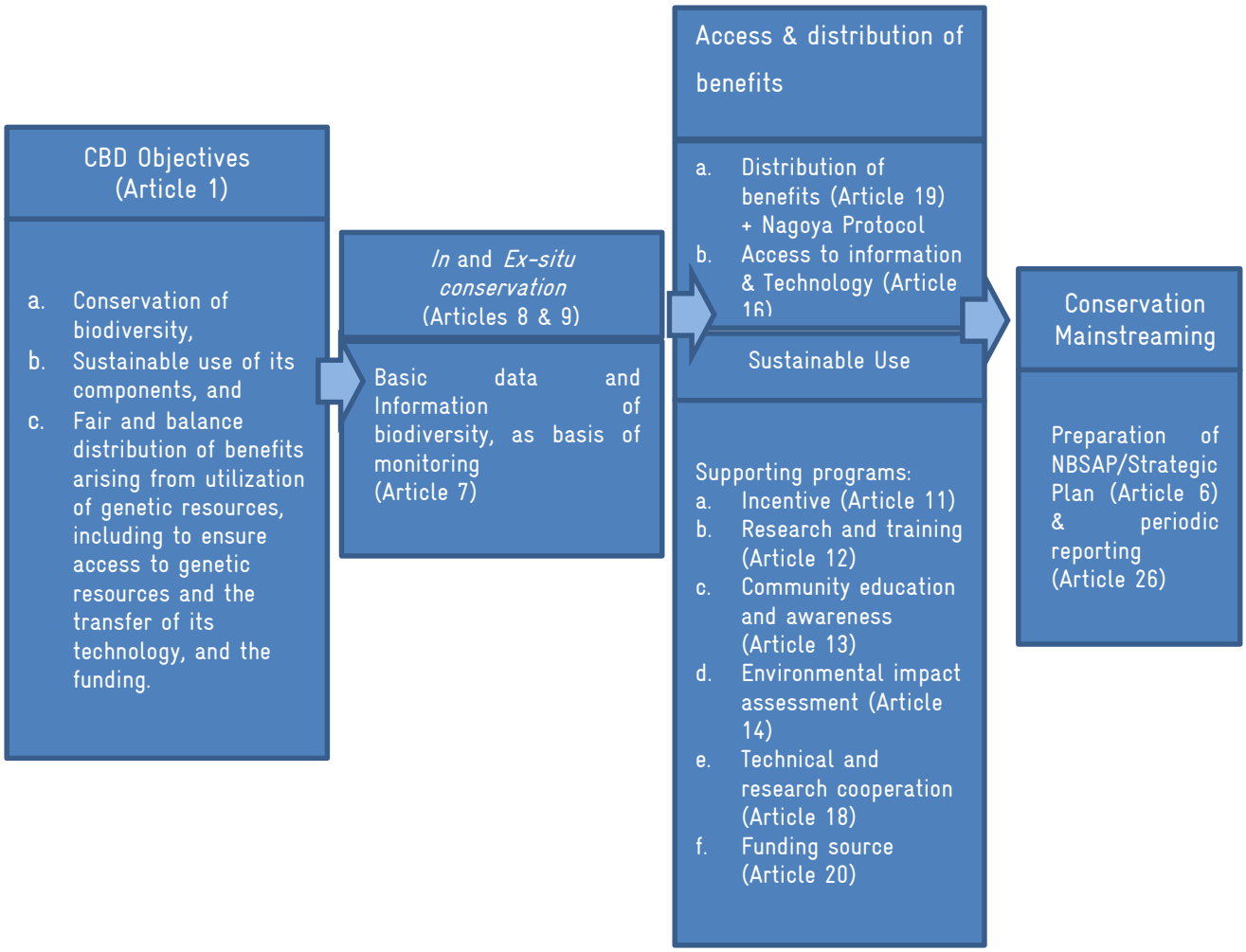

Figure 4.1. Scheme of the CBD

4.1.1. In-situ dan Ex-situ Conservation

In achieving the conservation goal, the CBD emphasizes the importance of in-situ and ex-situ conservation (Article 8 and Article 9), through a variety of programs including: (a) establishing a network of conservation/protected areas; (b) creating guidelines for development and management of protected areas; (c) managing important biological resources for conservation of biodiversity both inside and outside conservation areas; (d) promoting conservation/protection of ecosystems, natural habitats and maintain viable populations of species in their natural environment; (e) promoting environmentally friendly and sustainable development around conservation/protected areas; (f) conducting rehabilitation and restoration of degraded ecosystems and promoting recovery of threatened species; (g) preparing regulations to control the risk factors of the use and release of genetically modified organisms (GMOs), which can create negative impact on biodiversity, including risk to human health; (h) preventing the introduction of, controlling or eliminating invasive alien

species which threaten ecosystems, habitats or species; (i) make every effort to harmonize the use and conservation of biological diversity and the sustainable use of its components; (j) to respect, preserve and maintain knowledge, innovations and practices in ways of life of indigenous people and local communities which are in harmony with conservation and sustainable use of biodiversity; (k) to establish/maintain laws/regulations that protect threatened species/populations; (l) managing activities that affect biodiversity; (m) provide funding and other supports for the realization of the above mentioned activities. In *in situ* conservation, area managers are expected to perform initial identification of components of biodiversity as well as the processes and activities and also conducting periodic monitoring related to the dynamics of changes in habitat/population (Article 7).

As of *ex-situ* conservation (Article 9), it is advisable to: (a) adopt different ways of *ex-situ* conservation; (b) establish and maintain facilities for *ex-situ* conservation and conduct research on flora, fauna, and micro-organisms; (c) adopt methods to implement the recovery and rehabilitation of threatened species, to be reintroduced to their natural habitats, (d) regulate and manage collection of biological diversity derived from natural habitats for *ex-situ* conservation purposes; (e) provide funding to support the *ex-situ* conservatio *x-situ*.

4.1.2. Sustainable utilization

In order to make use of biodiversity sustainably, efforts which are feasible economically and socially are obliged to be adopted as incentives for the conservation and sustainable use (Article 11). Research and training (Article 12) shall also be carried out by: (a) establishing and maintaining education and training program, both scientifically and technically, (b) promoting and encouraging research that contributes to the conservation and sustainable use of biodiversity, and (c) promoting and cooperating in the use of scientific advances in biological diversity research in developing methods for conservation and sustainable use of biological resources.

The results of research and training need to be promoted through community education and awareness programs (article 13) through: (a) promoting understanding of the importance of biodiversity conservation and propagation, either through the media or integrating it in educational programs, and (b) cooperating with other countries as well as international organizations in developing educational and public awareness programs.

In Article 14, it is described that there is a need to conduct an Environmental Impact Assessment (EIA) before a development project is conducted. The EIA is expected that it can to reduce or eliminate negative impacts of development projects on biodiversity. In the EIA process there is also opportunities for public participation to give their opinion. Then, in Article 18 there is also emphasized that technical and scientific cooperation to increase the capacity of human resources and institutions is recommended primarily by developing countries through right national and international institutions.

Sources of funding for implementation of the CBD (Article 20) should be pursued by each country in accordance with their own capabilities, plans, priorities, and national programs. In this regard, developed countries are obliged to assist developing countries in forms of source of funding as well as technology transfer.

4.1.3. Access arrangements, transfer of technology, patent and benefit sharing

Warranty of access and equitable benefit-sharing on sustainable use of biodiversity are also mandated (Articles 16 and 19), by undertaking legislative, administrative, and policy efforts, so that the village/ forest communities that have been interacting and using biodiversity for in their daily lives since long ago, both for the fulfillment of food, medicine, housing and clothing, are treated fairly. It is further described in section 2.2 of Nagoya Agreement.

4.1.4. National Biodiversity Strategies and Action Plans/NBSAPs)

NBSAPs or equivalent instruments are instruments used for implementation of the CBD at national level. NBSAPs are plans and strategies to achieve objectives of biodiversity conservation through integration of sustainable use of biodiversity into the programs in all sectors, such as that mandated in Article 6 of the CBD and reported periodically (Article 26).

NBSAP Indonesia or better known as Indonesian Biodiversity Strategies and Action Plans (IBSAP) was first created in 1993 with the name of the Biodiversity Action Plan for Indonesia (BAPI), and then updated in 2003 for the period of up to 2020. IBSAP of 2003 to 2020 period has gone through changes associated with changes in biodiversity management paradigm with more emphasize on participation and transparency.

The main purpose of IBSAP 2003-2020 is to facilitate the activities of conservation and sustainable use of biodiversity as has been stated in the CBD. The specific objectives of IBSAP 2003-2020 are as follows: (a) assessing the needs and priorities of action as mentioned in the BAPI 1993, identifying what has been achieved, what could not been done, and find out why the needed funds and/or motivation have not yet been obtained.(b) to identify new needs and priority actions and revise plans of action based on potential changes in environmental policy at this time or in the future; (c) to identify existing opportunities and constraints for effective conservation and sustainable use of biodiversity, including gaps in existing knowledge, as well as setting targets and realistic actions to address these gaps; and (d) to prepare a new and clear strategy with a more detailed plan of action.

4.1.5. Next Step of CBD

Based on the above description of the CBD there are some things that need to be followed up at Provincial level, including:

(a) Formulation of Strategy and Action Plan on Biological Diversity at provincial level (Provincial Biodiversity Strategy and Action Plan)
(b) Identification/recording of the wisdom of traditional community
(c) Identification of the status of biodiversity of flora and fauna
(d) The preparation of biodiversity indicators for monitoring purposes.
(e) Develop a database of biodiversity
(f) Conducting a program of mainstreaming of biodiversity conservation in various sectors.

4.2. The Nagoya Protocol

The Nagoya Protocol is a supplementary agreement to the CBD that provide legal and transparent framework for the implementation of the three objectives of the CBD, namely the distribution of the fair and equitable benefits arising from the utilization of genetic resources, including assurance of access to genetic resources and transfer of its technology, by taking into account all rights over the resources and technology, and the funding. The Nagoya Protocol is an elaboration of Article 15 and Article 19 of the CBD.

The Nagoya Protocol will create certainty and transparency for both parties, namely the providers and users of genetic resources, by (a) making access to genetic resources more predictable and (b) help ensure the sharing of benefits when genetic resources leave the country of origin of the genetic resource provider. Nagoya Protocol applies to genetic resources covered by the CBD and the distribution of benefits on their utilization, including traditional knowledge associated with genetic resources contained in the CBD and the benefits arising from their utilization.

There are three obligations under the Nagoya Protocol that should be adhered to:

1) The obligation of access, namely (a) creating legal certainty; (b) providing rules and procedures that are fair and non-arbitrary; (c) making rules and procedures that are clear for approval of the initial information (free, prior and informed consent/FPIC) and terms to be mutually agreed; (d) providing license or permits on the given access; (e) creating conditions that promote and encourage research that contribute to biodiversity conservation and sustainable use; (f) paying attention to existing or potential cases of emergency that threaten human beings, animals, and plants; and considering the importance of genetic resources for food and agriculture in terms of food security.

2) The obligations of profit sharing. Profit sharing efforts at domestic level are to provide a fair and equitable sharing of benefits arising from the utilization of genetic resources with the country of origin of the provider of the genetic resources. Utilization includes research and development of genetic or biochemical composition of the genetic resources, including application and subsequent commercialization. The distribution are terms that have been mutually agreed on, while the

profits/benefits can be in forms of financial and non-financial, such as royalties and dissemination of information on research results.

3) The obligation of compliance. Some special obligations that support compliance with domestic legislation or regulatory requirements of providers of genetic resources and contractual obligations reflected in the terms that have been agreed on represent significant innovations of the Nagoya Protocol. The parties are obliged to: (a) take measures which the utilization of genetic resources within their jurisdiction has been accessed in accordance with the approval of initial information (FPIC-) and the terms that have been agreed upon have been made, and in accordance with the request of other parties; (b) cooperate in cases of alleged infringement of other party; (c) encourage the terms of contract on dispute resolution in the terms that have been agreed on; (d) ensure an opportunity is available to look for other alternatives in the legal system when a dispute occurs; (e) take measures of access to justice; (f) take measures to monitor the utilization of genetic resources after leaving a country, including through the creation of effective checkpoints at every stage of the value chain: research, development, innovation, pre-commercialization and commercialization.

4.3. National Biodiversity Strategies and Action Plans (NBSAPs)

At COP 9 in 2008 in Bonn, Germany it was agreed that there is a necessity for a revision of the strategic plan of 2003-2020. The revision was approved at COP 10 in Aichi Prefecture, Nagoya-Japan by submitting Aichi Biodiversity Targets for the period 2011-2020 (decision X/2 on the Strategic Plan for Biodiversity 2011-2020). This is a lesson learned) from the implementation of the strategic plan which was not achieved in 2010.

Aichi Target has 20 targets, which are grouped into 5 strategies 5 achievement, namely:

a. Strategic Objective A. Addressing underlying causes/Drivers of the loss of biodiversity by means of mainstreaming biodiversity in government and society.
b. Strategic Goal B. Reducing direct pressures on biodiversity and promoting sustainable use
c. Strategic Objective C: Improving the status of biodiversity through safeguards to the ecosystem, species and genetic diversity.
d. Strategic Goal D: Enhance the benefits of all forms of diversity and environmental services
e. Strategic Goal E. Enhance implementation of biodiversity conservation program through participatory planning, knowledge management and capacity building.

From the above targets it is very clear that the Aichi Targets formulated at COP 10, pay special attention to the management of the indirect causes (drivers) and direct causes (pressure) resulting in loss of habitat and biodiversity, in addition to efforts to improve the status of biodiversity.

4.4. RAMSAR Convention

The International Convention on the Conservation of Wetlands and Waterfowl/Ramsar, Iran 1971) or the Ramsar Convention is an agreement among countries that are committed to conserve important ecological characteristics of international wetlands especially that serve as habitats for water birds and to plan the utilization wisely and sustainably. This convention is not affiliated with any agreements between countries under the United Nations. The mission of this convention is the conservation and use of wetlands through local and national actions through international cooperation as a contribution to achieving sustainable development throughout the world.

At this convention the position of South Sumatra Province was very important because Sembilang National Park was one of Indonesia's wetlands which was registered in the Ramsar Convention, in addition to Berbak National Park (Jambi), Sentarum Lake National Park (West Kalimantan), Pulau Rambut Wildlife Reserve (Jakarta), Rawa Opa Watumohai National Park (South Sulawesi), Tanjung Puting National Park (Central Kalimantan), and Wasur National Park (Papua). This required the local government of South Sumatra conducted various programs to reduce pressures (Drivers & Pressure) in addition to finding efforts to utilize it in a sustainable manner.

4.5. Biodiversity Conservation in the Context of MRV REDD +

Reducing Emissions from Deforestation and Forest Degradation including reforestation, forest carbon stock conservation and sustainable management of forest/REDD+ is one of the mechanisms to mitigate global climate change by means of reducing greenhouse gas emissions from deforestation and forest degradation, conservation of forest carbon stocks and peat lands, sustainable forest management, and enhance forest carbon stocks. REDD+ scheme was proposed by Papua New Guinea and Costa Rica at the Conference of the Parties /COP 11 in Montreal in 2005, which was later adopted at COP 13 (FCCC/CP/ 2007/6/Add./2/CP. 13) and was recognized in Copenhagen Agreement (Copenhagen Accord) at COP 15 (FCCC/CP/2009/11/Add.1/4/CP.15).

In addition to REDD+ other mitigation measures that have been implemented by Indonesia at national level is the National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK) which is regulated by Presidential Decree 61/2011. In RAN-GRK, the REDD+ is grouped as effort to reduce emissions from the forestry sector (Agriculture, Forestry, and Other Land Use/AFOLU). Indonesia's emissions reduction target in 2020 is 26% of the scenario of Business As Usual (BAU) on the country's own efforts and 41% with the cooperation of international community (President's speech at the G20 forum in Pittsburgh-Pennsylvania USA, on September 25, 2009). Periodically, each country reported its GHG emissions to the United Nations Framework Convention on Climate Change (UNFCCC).

In relation to GHG emissions monitoring in REDD+, each country is required to perform activities of measurement, reporting and verification (MRV), in accordance with the mandate of the Bali Action

Plan at COP 13 in 2007 (1/CP.13 paragraph 1 (b) (ii)), the Cancun agreement at COP 16 in 2010 (add 1/C/ Par.70, 1/CP.16 par 61, par 62 and par 71), and the conclusion at SBSTA 36 in Bonn in 2012. Indonesia has designed the MRV structure as shown in Figure 4.2.

At national level there are two monitoring activities, namely Measurement and Monitoring of Deforestation (MODEF) and National Emission Measurement and Monitoring, which can be divided into peatland emissions (National Level Peat Emission Monitoring (NAPEM) and non-peat (National Level Land- based Emission Monitoring (NALEM). In MODEF monitoring of deforestation is conducted near real time per month by using low resolution satellite data (Moderate-Resolution Imaging Spectroradiometer/MODIS or the National Oceanic and Atmospheric Administration/NOAA).

The objective of MODEF is to obtain information on deforestation as early as possible, so that appropriate action can be taken. NALEM and NAPEM are conducted every two years. NALEM uses high-resolution satellite data, while NAPEM is done by direct measurement in the field. At the sub-national level there are also emissions measurements on dry land (SALEM) and peat (SAPEM). In the scheme of MRV REDD+ the biodiversity monitoring is placed on Safeguard Framework Information Systems. The monitoring of biodiversity is conducted biennially.

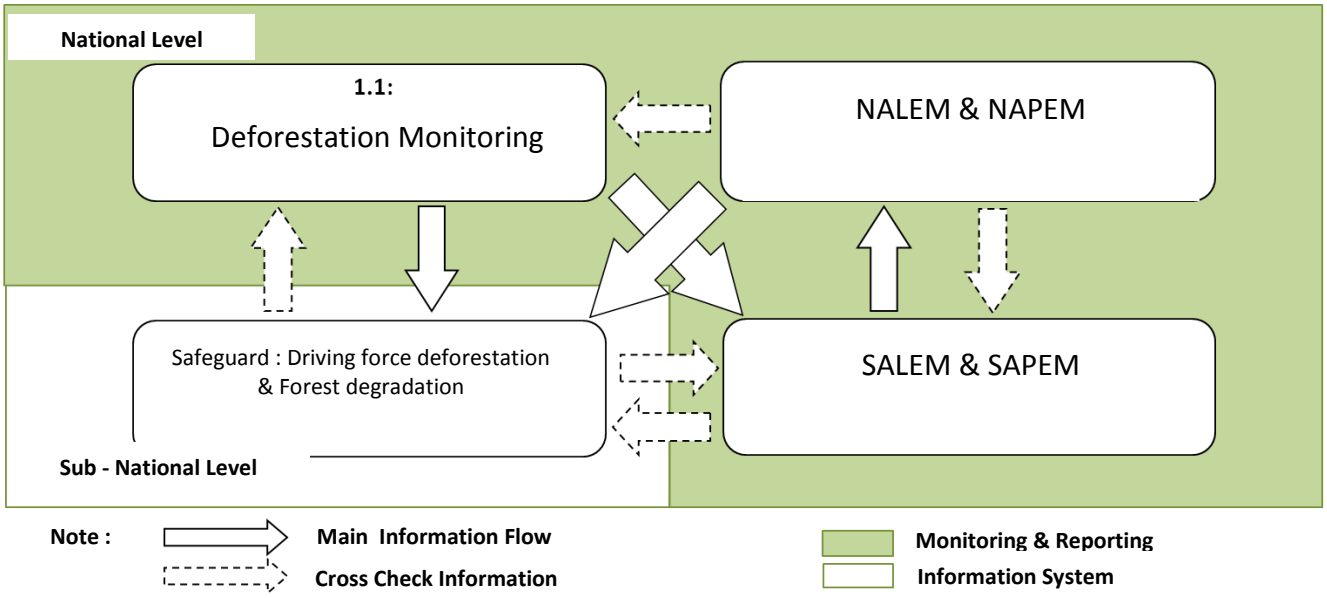

Figure 4.2. Scheme of MRV REDD+ Indonesia

Security Framework principles have been agreed in the Cancun Agreements (Cancun Agreement) at COP 16 (FCCC / CP / 2010/7 / Add.1 / C / App.I / Par.2), namely:

a. The conducted activities are consistent with the objectives of national forest programs, conventions, and related international agreements.
b. The structure of national forest governance that is transparent and effective, considering the applicable provisions of law and the sovereignty of the country concerned.

c. Respect for the knowledge and rights of indigenous peoples and local communities, taking into account national responsibilities, conditions and law.
d. Full and effective participation of the parties, especially indigenous and local communities.
e. Consistent with the conservation of natural forests and biodiversity, and be able to provide incentives for the protection and conservation of natural forests and ecosystem services, as well as to improve social and other environmental benefits.
f. Actions to address reversals.
g. Action to reduce emissions diversion.

For implementation, Indonesia has built Principles, Criteria, and Indicators of Safeguards Indonesia (PRISAI) containing 10 principles which are developed from the 7 safeguard principles above, as follows:

a. Verify the status of rights of the land and territory.
b. Complete or consistent with emission reduction targets, relevant international conventions and agreements.
c. Improving forest governance.
d. Respect and empower knowledge and rights of indigenous people and local communities.
e. Full and effective participation of stakeholders and to consider gender equality.
f. Strengthen the conservation of natural forests, biodiversity, and ecosystem services.
g. Action to manage reversals.
h. Action to reduce emissions diversion.
i. The benefits of REDD+ are shared equitably to all the rights holders and relevant stakeholders.
j. Ensure that information is transparent, accountable and institutionalized.

Based on the Cancun Agreement, biodiversity is contained in the 5th safeguard framework, that is "Consistent with the conservation of natural forests and biodiversity, and is able to provide incentives for the protection and conservation of natural forests and ecosystem services, as well as to improve the social and other environmental benefits". Whereas according to PRISAI, conservation of biodiversity is the 6th principle, namely "to strengthen the conservation of natural forests, biodiversity, and ecosystem services". The principles outlined above are in line with the objective of achieving the Aichi Targets.

An important thing that needs to be observed is the 10th principle that is how to build transparency and accountability of biodiversity information. Equally important is how to build institutions or coordination between institutions that are able to manage biodiversity information at the level of South Sumatra Province. It is necessary to synergize role of REDD+ Working Group, Forestry Agency, Forest Management Unit (FMU) and the Natural Resources Conservation Center (BKSDA) in the management and distribution of biodiversity information. The development of Biodiversity Information

System which is supported by all stakeholders at the level of South Sumatra Province needs to become a priority program. This information system becomes part of Safeguards Information System at national level.

V. DEFINITION OF THE CONTENT OF THE SUB NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN BASED ON NATIONAL BIODIVERSITY STRATEGIES AND ACTION PLANS (NBSAPS)

This chapter provides direction and defines the contents of the document of Sub-National Biodiversity Strategy and Action Plan. This document is a derivative of the National Biodiversity Strategy and Action Plan, which consists of at least five main chapters, which is structured as follows.

Chapter I. Description of the document and purpose of its preparation

- 1.1. Description of the document
- 1.2. Purpose of the document preparation

Chapter II. Present condition of habitats & biodiversity

- 2.1. Trend of habitat change
  - 2.1.1. Forest Ecosystem
    - a. Low land forest
    - b. Swamp and peat forest
    - c. Mangroves
    - d. Riparian
  - 2.1.2. Agroforestry (Jungle rubber)
  - 2.1.3. Agriculture and plantation
- 2.2. Biodiversity
  - 2.2.1. Terrestrial Ecosystem
  - 2.2.2. Swamp and Peat Ecosystem
  - 2.2.3. River and Riparian Ecosystem
  - 2.2.4. Coastal and Marine Ecosystem
- 2.3. Drivers & Pressures of Degradation of Habitat and Species Diversity
- 2.4. Policy/Program (Response) of regional government for conservation of habitat and species diversity

Chapter III. Biodiversity management strategy and action plan

- 3.1. Vision & Mission
- 3.2. Goals
- 3.3. Biodiversity Conservation Action Plan

Chapter IV. Biodiversity Conservation Management Strategy

Chapter V. Implementation Strategy of Biodiversity Conservation Action Plan

REFERENCES

APPENDICES

5.1. Description of the report and purposes of its preparation (Chapter I)

Chapter I contains a description of the report and the purpose of the preparation of the report. This chapter can be divided into two sub-chapters, namely the description of sub-chapter of description of the document, and sub-chapter of purpose of the document preparation. The description of the document outlining the relationship between the Biodiversity Strategy and Action Plan at Provincial and National levels.

In addition, it is also necessary to be explained the position of this document compares to other regulation and international agreements such as the Convention on Biodiversity (CBD) which has been enacted into Law No. 5, 1994 on the ratification of the United Nations Convention on Biological Diversity, and Law No. 11, 2013 on the ratification of the Nagoya Protocol, namely access to genetic resources and the fair and equitable sharing of benefits arising from their utilization to the convention on biological diversity).

In addition, it should be emphasized the relation between the report and REDD+ which has been agreed at COP 13 in Bali in 2007, where the government has set PRISAI (Principles, Criteria and Indicators Safeguard Indonesia) as a follow up. PRISAI contains 10 principles which were developed from the 7 principles of the safeguards of the Cancun Agreement, which was agreed at the 16th meeting of the parties (COP 16) of the United Nations Framework on Climate Change (UNFCC) in 2012 in Mexico. The 5th principle of PRISAI is Supporting biodiversity, protection of natural forests and environmental services. In the description of the purpose of the preparation of the document it is described briefly the contents of the document chapter by chapter.

5.2. Present condition of habitat & biodiversity (Chapter II)

Chapter II describes the current condition of habitats and biodiversity. In this chapter there is a need of support of data that is up to date. The data is obtained from secondary data derived from reports of various related parties, government agencies, NGOs or researchers from universities. At the first FGD meeting in Palembang and at the second in Jakarta, important types of habitat that have been identified in South Sumatra Province include peat swamp forests, mangroves, forest lowland, upland forest, agroforestry rubber, agriculture and plantations. In addition, it has been known about some research related to several important species including elephant, Sumatran tiger, crocodile sinyulong, hornbills, and Ulen.

Sub-chapter 2.1 on habitat change can be done by comparing satellite imagery data after spatial classification and analysis by using Geographic Information System (GIS).

Sub-chapter 2.2 on biodiversity outlines the current conditions of biodiversity in various ecosystem/ habitat types, namely terrestrial, swamp and peat, rivers and riparian, coastal and marine. The data is in various institutions/agencies including Indonesian Institute of Science (LIPI), NGOs, Ministry of

Forestry, Natural Resources Conservation Agency (BKSDA) & Universities. The compilation of the data supposes to be conducted through workshops attended by the parties.

The next sub chapter describes factors as drivers and pressure. The drivers are not direct factors affecting biodiversity, while the pressure is a direct factor. One example of drivers is price of Crude Palm Oil (CPO), which will affect farmers to open forest and replace it with oil palm plantations.

Response is a program, activity, policy and/or regulations issued to manage the Drivers/Pressure, so it can suppress the loss of habitat and biodiversity.menerangkan kondisi terkini dari habitat dan keanekaragaman hayati. Pada bab ini diperlukan dukungan data yang mutakhir (*up to date*). Data didapatkan dari data sekunder yang berasal dari laporan berbagai pihak yang terkait, lembaga pemerintah, LSM ataupun peneliti dari perguruan tinggi. Pada pertemuan FGD pertama di Palembang dan Kedua di Jakarta, telah diidentifikasi tipe habitat dari Provinsi Sumatera Selatan yang penting meliputi hutan rawa gambut, mangrove, hutan dataran rendah, hutan dataran tinggi, agroforestri karet, pertanian dan perkebunan. Selain itu telah diketahui beberapa riset terkait dengan beberapa spesies penting diantaranya Gajah, Harimau sumatera, Buaya sinyulong, Rangkong, dan uUlen.

Sub-chapter 2.1 on habitat change can be done by comparing satellite imagery data after spatial classification and analysis by using Geographic Information System (GIS).

Sub-chapter 2.2 on biodiversity outlines the current conditions of biodiversity in various ecosystem/ habitat types, namely terrestrial, swamp and peat, rivers and riparian, coastal and marine. The data is in various institutions/agencies including Indonesian Institute of Science (LIPI), NGOs, Ministry of Forestry, Natural Resources Conservation Agency (BKSDA) & Universities. The compilation of the data supposes to be conducted through workshops attended by the parties.

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Response is a program, activity, policy and/or regulations issued to manage the Drivers/Pressure, so it can suppress the loss of habitat and biodiversity.

5.3. Biodiversity Management Strategy and Action Plan (Chapter III)

Chapter III is an important part of the document that determines the vision, mission, objectives/goals and action plans for the conservation of biodiversity. In preparing this chapter, it is better to do it through a Focused Group Discussion (FGD) with stakeholders, however the draft document can be prepared by an ad hoc team.

The action plan is intended primarily for the conservation of species and habitats and ecosystems. As a basis for determining priority of protected species one can refer to Regulation No. P.57/Menhut-

II/2008 on the strategic direction of the national species conservation in 2008 – 2018. In the attachment of this Regulation the recommended target species are based on groups of birds, mammals, primates, herpetofauna, insects, marine and freshwater species and aquatic plants. Generic criteria used are endemicity, status of population (size and inclination), habitat conditions (area, quality and availability), threats (type and level of threat) and management status (existence of management plan) (Mardiastuti *et al.* 2008).

The determination of priority ecosystem is based on the uniqueness of the ecosystem and the level of threats to it. In South Sumatra, there are mangroves, peat swamp forest, and lowland and highland forests. Based on FGD 1, the most vulnerable ecosystem is the peat swamp forest which is decreasing because of land clearing for oil palm plantations.

At the time of preparing the strategy and action it is better to take account international agreements that are made or recognized by the Government, such as the Aichi Targets as a derivative of the CDB. Because Aichi has a very measurable outcome, then in preparing the document of Biodiversity Strategy and Action Plan on Sub-national level, it should be based on the data, so that the achievements can be demonstrated by using measurable criteria and indicator.

5.4. Biodiversity Conservation Management Strategy

Chapter 4 describes biodiversity conservation management strategy. This strategy can adopt the implementation strategy of biodiversity conservation at the national level, by making changes and adapting it to conditions in South Sumatra in relation to existing human resources and institutional capacities.

NBSAPs documents describe two conditions that may be encountered when performing the management of biodiversity conservation, namely the ideal and minimum conditions. This condition is very influential on the level of difficulty of strategy implementation. Ideal condition can be achieved when the conservation strategy can be applied in ideal condition, such as open and inclusive, legally binding, getting financial and technological supports, and development has been conducted in accordance with the principles of sustainable development and good governance. In addition, there is a possibility to measure the success of the program by using indicators through monitoring and evaluation mechanisms.

The second condition is the minimum conditions, when the implementation of the programs is carried out by an ad hoc team, through dissemination, communication and socialization. The management strategy program is not legally binding and only voluntary and based on the commitment of the parties alone.

5.5. Implemmentation Strategy of Biodiversity Conservation

Chapter 5 describes Implementation Strategy of Biodiversity Conservation Action Plan. The Implementation Strategy can refer to the achievement of the Aichi Targets, namely (a) Strategy to address underlying causes/Drivers of the loss of biodiversity by means of mainstreaming biodiversity in government and society, (b) Strategy to reduce irect pressures on biodiversity and promoting sustainable use, (c) Strategy to improve the status of biodiversity through safeguards to the ecosystem, species and genetic diversity, (d) Strategy to enhance the benefits of all forms of diversity and environmental services, (e) Strategy to enhance implementation of biodiversity conservation program through participatory planning, knowledge management and capacity building.

REPORT PART 2

VI. Approach for in Creating Criteria, Indikator Framework

VII. Criteria, indicator and parameter monitoring

VII. Priority Program

VI. APPROACH IN CREATING INDICATOR AND PARAMETER FRAMEWORK

Biodiversity in a landscape is highly affected by disturbance, because disturbance influence level of landscape heterogeneity that brings implication on the changes in species diversity. Landscape heterogeneity is highly related to the magnitude and frequency of disturbance. Disturbance is a direct activity happening on a landscape that changes the landscape physically, such as forest clearings for plantation, agricultural land or forest plantation. Disturbance will create habitat degradation, habitat loss, and will change landscape shape and structure. Low and moderate disturbance will cause an increase in heterogeneity, whilst a very high disturbance will cause a decrease in landscape heterogeneity level or will change it into homogeneous landscape (Forman & Godron, 1986) that can trigger extinction /decline in species diversity. The role of disturbance was also discussed in the theory of The Intermediate disturbance hypothesis (Connel, 1978; Townsend & Scarsbrook, 1997), which stated that equilibrium cannot be reached when there is a continuous disturbance, because disturbance will always create new room for re-colonization.

Disturbance happening in a landscape might be caused by various triggering factors, also called indirect factor/driving force/drivers. One of the drivers is human population growth. Human population growth drives the increase of demand on land for settlement, agriculture, and infrastructure. A report by FAO in 1990 and several scholarly articles such as Barbier et al. (1993) and Fraser (1996) had concluded that demographic factors negatively correlated with forest area size. The second driver is economic crisis. An example of economic crisis that had happened is the 1997/1998 economic crisis. During the crisis, level of poverty increased, so did level of dependency on forest resources. However, export commodities such as oil palm and cacao experienced an increase in price. This situation had driven forest clearings for the extension of export commodity plantation (Sunderlin, et al. 2000 & 2001).

Government policies can also become drivers/indirect causes of habitat degradation. According to several scholars the transition period from centralistic periods to regional autonomy during 1998-2003 had brought about a big influence on deforestation. That period of full uncertainty in laws/legal aspects had caused encroachment and occupation of forest areas. Wulan, et al. (2004) found that based on information from mass media, during 1997-2003 there were 359 conflicts in forest area, including Timber Estate (HTI) (39%), Timber Concession (IUPHH) (27%), and conservation areas (34%). The implementation of Community based Forest Resources Management (PHBM) policy in Kuningan District since 1999 has been able to increase forest cover (Prasetyo et al., 2008).

In the efforts of forest resources conservation, understanding the relationship between the drivers and their consequence landscape changes is crucial. Conservation efforts often fail when drivers and disturbance/pressure were not responded well. EEA (2005) and some scholars introduced DPSIR

(Driver, Pressure, State, Impact and Response) approach, which is an approach to understand that causal-effect relationship.

6.1. Driver, Pressure, State, Impact & Response (DPSIR) Approach

The concept of Driver, Pressure, State, Impact and Response (DPSIR) was, at the beginning, a concept of Pressure – State – Response (PSR), which was created by Organization for Economic Co-operation and Development (OECD) (1994), as general framework to construct environmental indicator data. This approach was then developed by EEA (2005) by inserting Drivers (P) and Impact (I) components to collect, analyze, and report environmental data to countries joining OECD. This approach was arranged based on framework of thought that environmental condition (environmental state) will change because of direct (pressure) and indirect (driver/driving force) influencing factors from economic activities and human pressure (demography). Environmental change will create negative impact, such as decrease in environmental services, ecosystem disturbance, and threats to organisms within. As an effort to manage impacts, people have done various efforts (response) in the forms of law/regulation intervention, programs and projects. Response can be directed towards managing the drivers, state or impacts. Effectiveness of those various responses determine the quality, improvement of environmental service and the sustainability of ecosystem and organisms within. A conceptual framework of DPSIR for the changes in land cover/land use at certain spatial scale (National, or Sub-National) is presented in Figure 6.1.

Lately, the framework of DPSIR approach has been used often for research in various fields. Song and Frostel (2012) used DPSIR to monitor ecological restoration of river and suggested to focus monitoring that is oriented to pressure. Similar suggestion was given by Spangenberg (2007) for studies in biodiversity; because data on biodiversity is hard to obtain whilst actions to minimize its decline are urgently needed, policies should be made based on its drivers and pressures that can measurably be monitored. Omann, Stocker, and Jäger (2009) concluded that DPSIR is very good in constructing a correlation analysis between global climates that serve as a driver and its consequences related to biodiversity, environmental services, and its policy responses.

In another case, Ness, Anderberg and Olsson (2010) showed that DPSIR approach can help describe and understand the relationship between key drivers and people's response at different spatial levels that has problems in environmental sustainability. One thing to be emphasized is when using DPSIR one should be very careful in mapping the causal-effect relationship, consistent to the definition of DPSIR and its spatial scale. In the context of biodiversity monitoring, monitoring is not only aimed at the status of biodiversity and its habitat (state), but also including monitoring of driver, pressure, impact and response from the managers (Boyle et al. 1997); thus the built indicator and parameter should include indicators and parameters for D, P, S, I and R.

6.2. Determination of Biodiversity Indicator and Parameter

Biodiversity is a product of a natural succession process, disturbance, and interaction between species and their habitats during a long period. Human activities to fulfill their needs will highly influence biodiversity. Sustainability of diversity is used as one of the criteria of good forest management (Boyle et al 1997). In 2002, biodiversity conservation started to receive huge world political attention in the conference on parties at the Convention on Biological Diversity/CBD. Parties agreed to execute programs in order to stop loss of biodiversity.

Based on the Convention on Biological Diversity (CBD), biodiversity is defined as the diversity of living things from all sources, including among others land, ocean, and other aquatic ecosystem and ecological component that are parts of its diversity. The complexity of this biodiversity can be seen in 3 different levels, namely, ecosystem diversity, species diversity, and genetic diversity (EASAC, 2005). Gaston & Spicer (1998) provided different terminology in dividing levels of diversity, namely ecological diversity, organism diversity, and genetic diversity.

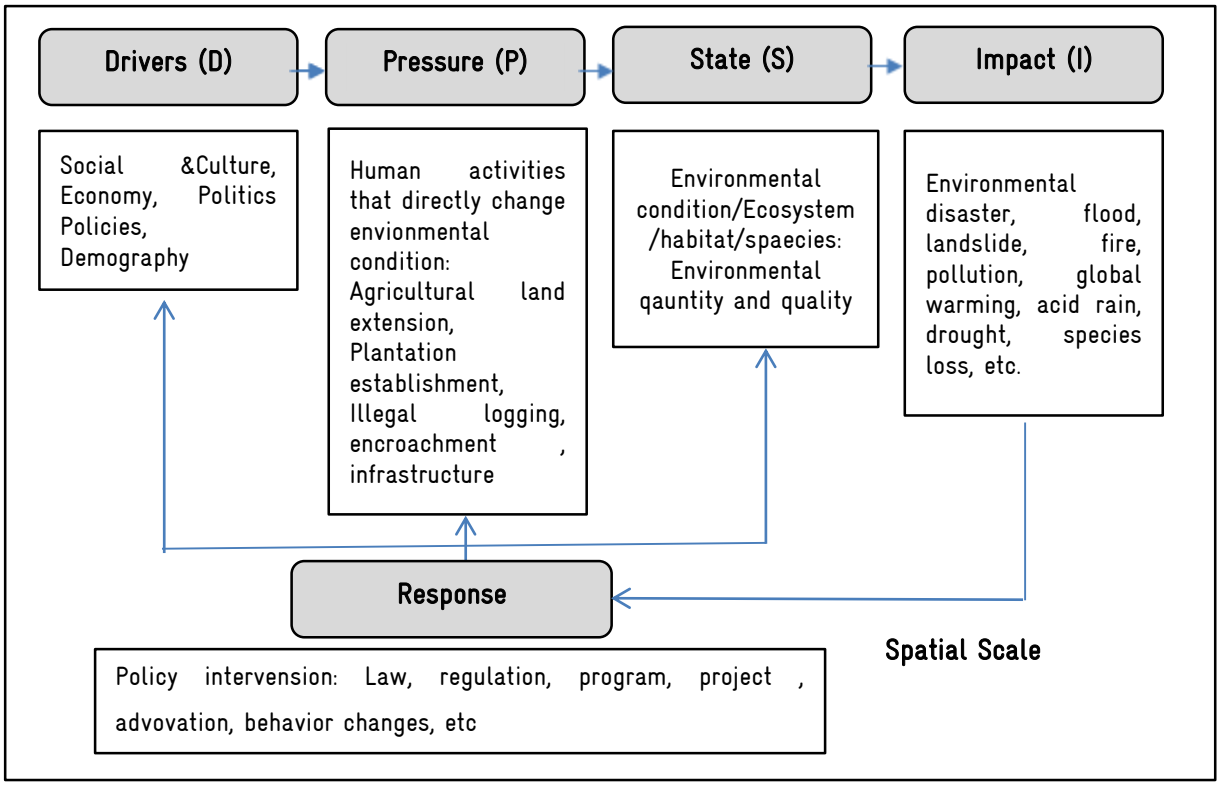

Figure 6.1. DPSIR Concept

At the level of ecosystem/ecological diversity, biodiversity is viewed from different spatial scales, from biome, bioregion, landscape, ecosystem, habitat, to niche. The smaller spatial dimension the more detailed data is required for a basis in classifying ecosystem/habitat types. Organism/Species diversity refers to biodiversity at the levels of Kingdom, division, class, order, gamily, genus, and species to

sub-species. Whereas genetic diversity views the diversity in levels of population to genes. Although there are 3 separate levels, those three are interrelated, thus it is possible to – for example- compare species diversity in different ecosystem types and examine genetic diversity at different species diversity levels. Looking at diversity focusing on one level of diversity, for example looking at species without looking at ecosystem diversity, may produce bias in understanding biodiversity, and it is not sufficient for a basis in diversity management at landscape level.

To measure a total biodiversity is an impossible task; thus an indicator to represent total diversity is required (Heink & Kowarik, 2010, Leveque & Mounolou, 2001). However, even indicator needs long time, high cost, and human resources with certain skill levels (Kallimanis et al. 2012), so it is necessary to select an accurate indicator. Indicator is quantitative measures as a representative of a complex biodiversity condition, including genetics, species or population, and habitat structure that can be communicated in a simple manner. The degree of complexity of biodiversity made it impossible to have only one indicator (Duelli &nObrist, 2003), thus the most accurate indicator that suits biodiversity management objectives should be selected.

Nomander et al. (2012) suggested several criteria that can be used in selecting diversity indicator such as presented in Table 6.1.

Table 6.1. Criteria of selection for biodiversity indicators

No	Criteria	Description
1.	Representation and wide distribution	Able to represent a wide area , or a group of species, or has a wide spatial distribution
2.	Temporary and can be updated	Able to show a trend of changes and data can be updated
3.	Simple	Able to simplify a complex information
4.	Informative	Can be clearly presented
5.	Indicative	Able to show an indication of change
6.	Sensitive	Sensitive in detecting changes caused by human activities
7.	Quantitative and can be used statistically	Based on measurement so it can be statistically analyzed.
8.	Free from sample size limitation	Can be used even with low number of samples
9.	Realistic	Based on a monitoring program that is economically feasible
10.	Accepted and suits for the needs	Suits to the needs and recognized by users
11.	Normative and according to policy	Have correlation with baseline information and objective target politically (target from international convention)
12.	In-sensitive to natural fluctuation	Resistant to impact from natural changes, but sensitive to changes from human activities
13.	Easy to describe	Impact and changes significant, measurable by using index.
14.	Predictable	Can be used for prediction and related to economic model.
15.	Comparable	Can be compared

6.2. Lanskap Ecological approach (Structure & Function of Landscape)

6.2.1. Landscape Definition

According to Forman and Godron (1986) a landscape is a heterogeneous natural area composed of an interacting cluster, whilst according to Zonneveld (1979) landscape is a part of earth surface that contains a complex ecosystem made from rock, water, vegetation, animal and human activities. Both are implicitly agree with a landscape made of landscape units that interacts each other.

The science of landscape ecology (Landschaft ecology) is a combination of geography and ecology, which firstly used in 1971 by Carl Troll, a German geographer. Further, Forman and Godron (1985) defined that Landscape Ecology focused on three landscape characters, namely, structure, function, and landscape change. Structure refers to spatial relationships between ecosystem and landscape elements; function is the interaction among components that compose a landscape , and change is dynamics in changing of landscape structure and function as a product of disturbance either natural or human-derived. In the DPSIR context, disturbance is pressure.

6.2.2. Structure and Function of Landscape

Landscape structures can be distinguished into patch, matrix, corridor and edge (Figure 6.2). Patch is a homogenous area which can be distinguished from its surroundings. The homogeneity concept is highly relative, depends on the scale we see the landscape. If we look at the landscape vertically by using a satellite, then the homogeneity of the landscape is highly determined by the resolution of the pixel that can be detected by the satellite's sensor. The smaller the pixel's resolution the more detail the satellite's sensor can distinguish objects on the surface of the earth, meaning that the recorded landscape will be more heterogeneous, so that more patches can be detected (Figure 6.3).

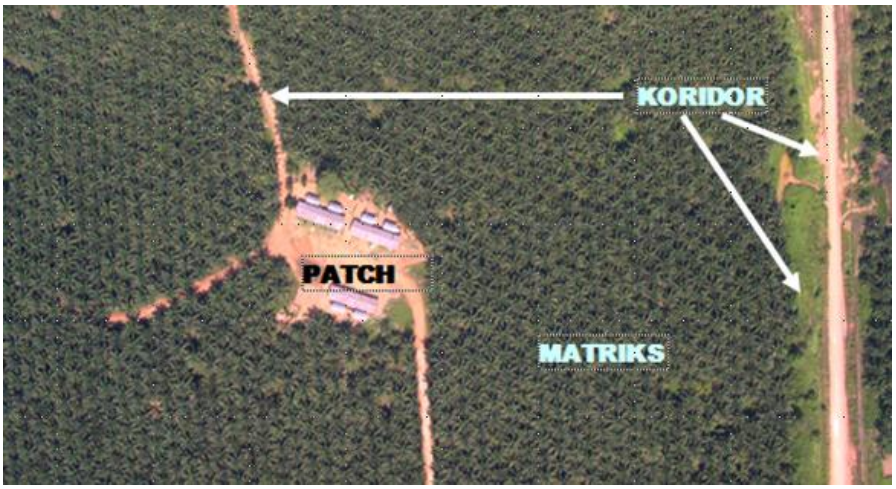

Figure 6.2. Landscape Structure

Corridor is an elongated patch, and matrix is a dominant patch on a piece of landscape, whereas edge is the border between different patches or between patch and matrix. The more the number of different patches, the longer and the bigger the density of edges.

The structure of landscape is highly determined by causal factor, namely disturbance. A very big and massive disturbance will cause a landscape to become homogenous, while a small and sporadic disturbance will cause a landscape to become more heterogeneous (Godron & Forman, 1986). A big scale of forest fire and a mountain eruption are examples of disturbance that cause a landscape to become more homogenous. The type of disturbance also highly affects the landscape succession, a disturbance with a chronic character will disturb the landscape succession/recovery process, while a disturbance with a temporary character will give opportunity to the landscape to return to its original shape. The conversion of forest into plantation is an example of a chronic disturbance. The structure of landscape highly affects its function. Landscapes with high number of patches which are varied and small will be seen more fragmented than those with small number of patches which are big in size. Highly fragmented landscapes will cause a process of species isolation which results in rarity, especially to species that needs special habitats and wide home range.

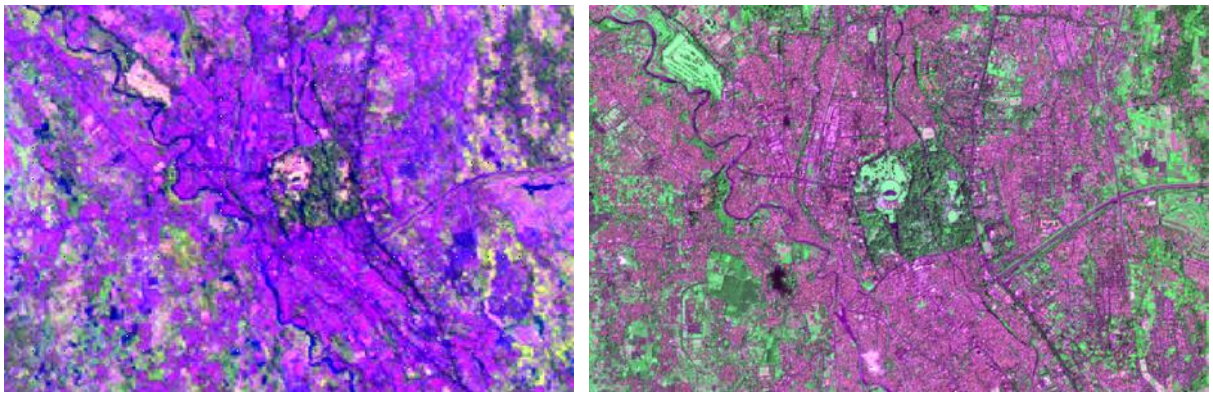

Figure 6.3. Difference Resolution (a) Landsat 30 x 30 m), (b) Ikonos (0.67 x 0.67 m)

In improving habitat function then there is a need of corridor to connect separate patches. This approach adopts the theory of island biogeography of MacArthur and Wilson (1967), which later was adopted as a basis of good conservation plan (Diamond, 1975) (Figure 6.4).

According to this concept, a good design of conservation area should be wide and compact. If the first requirement is not met then there is a second alternative, namely narrow but not fragmented, and if it is fragmented then choose the one with distance between fragments is close or they are connected with corridor. If there is only one patch, the one with a round shape (iso-diametric) is better.

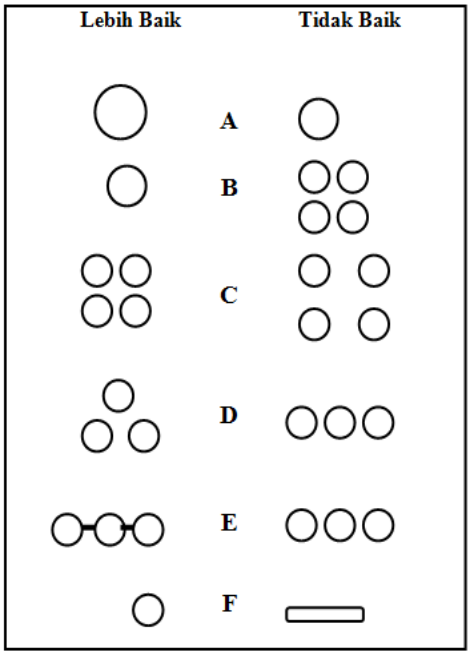

Figure 6.4.Conservation Area Structure

6.2.3. Variable (Index) of Landscape

After Geographical Information System (GIS) was developed in early 1990 and supported by the availability of remote sensing data, quantification of landscape structure developed. There are two software that are commonly used for landscape structure analysis, namely Patch Analyst and Fragtstat.Patch Analyst was developed by the Centre for Northern Forest Ecosystem Research – Ontario Ministry of Natural Resources (http://www.cnfer.on.ca/SEP/ patchanalyst/) whilst fragstat was developed by Oregon State University (http://www.umass.edu/landeco/ research/fragstats/fragstats.html). Both software can measure various landscape indices related to landscape diversity, landscape shape and structure and degree of fragmentation (Table 6.7).

Table 6.2. Indicator and Variable (Index) on Fragstat and *Patch* Analysis

Fragstat		***Patch*/Habitat Analysis**	
Indikator Luas (Area Metrics)		Indikator Luas (Area Metrics)	
AREA	Area	CA	Class Area
LSIM	Landscape Similarity Index (%)	TLA	Total Landscape Area
CA	Class Area		
%LAND	Percent of Landscape (%)		
TA	Total Landscape Area		
LPAI	Largest *Patch* Index (%)		
Indikator Luas Fragment (*Patch* density, *patch* size and variability metrics)		Indikator Luas Fragment (*Patch* density, *patch* size and variability metrics)	
NP	Number of *Patch*es (#)	NP	Number of *Patch*es
PD	*Patch* Density (#/100 ha)	MPS	Mean *Patch* Size
MPS	Mean *Patch* Size (ha)		Media *Patch* Size

Fragstat		*Patch*/Habitat Analysis	
PSSD	*Patch* Size Standard Deviation (ha)	PSCV	*Patch* Size Coefficient of Variant
PSCV	*Patch* Size Coefficient of Variation (%)	PSSD	*Patch* Size Standard Deviation
Indikator panjang tepi (Edge metrics)		Indikator panjang tepi (Edge metrics)	
PERIM	Perimeter (m)	TE	Total Edge
EDCON	Edge Contrast Index (%)	ED	Edge Density
TE	Total Edge (m)	MPE	Mean *Patch* Edge
ED	Edge Density (m/ha)	CWED	Contrast Weighted Edge Density
CWED	Contrast-Weighted Edge Density (m/ha)		
TECI	Total Edge Contrast Index (%)		
MECI	Mean Edge Contrast Index (%)		
AWMECI	Area-weighted mean edge contrast index (%)		
Indikator bentuk fragment (Shape metrics)		Indikator bentuk fragment (Shape metrics)	
SHAPE	Shape index	MSI	Mean Shape Index
FRACT	Fractal dimension	AWMSI	Area Weighted Mean Shape Index
LSI	Landscape shape index	MPAR	Mean Perimeter Area Ratio
MSI	Mean shape index	MPFD	Mean *patch* fractal dimension
AWM	Area-weighted mean shape index	AWMPFD	Area weighted mean *patch* fractal dimension
DLFD	Double log fractal dimension		
MPFD	Mean *patch* fractal dimension		
AWM	Area-Weighted Mean *Patch* Fractal Dimension		
PFD			
Indikator luas core (Core area metrics)		Indikator luas core (Core area metrics)	
CORE	Core Area (ha)	TCA	Total Core Area
CAI	Core Area Index (%)	CAD	Core area density
NCORE	Number of Core areas (#)	MCA	Mean Total Core Area
%LAND	Core area percent of landscape (%)	CASD	Core Standard Deviation
TCA	Total Core Area (ha)	CACV	Core Area coefficient of Variation
NCA	Number of Core Areas (#)	TCAI	Total Total Core Area Index
CAD	Core area density (#/100 ha)		
MCA1	Mean Core Area per *Patch* (ha)		
CASD1	*Patch* Core Area Standard Deviation (ha)		
CACV1	*Patch* Core Area Coefficient of Variation (%)		
MCA2	Mean area per disjunct Core (ha)		
CASD2	Disjunct Core area Standard Deviation (ha)		
CACV2	Disjunct Core area Coefficient of Variation (%)		
TCAI	Total Core Area Index (%)		
MCAI	Mean Core Area Index (%)		
Indikator konektivitas lanskap (Nearest-neighbor metrics)		Indikator konektivitas lanskap (Nearest-neighbor metrics)	
NEAR	Nearest-neighbor distance	MNND	Mean Nearest Neighbor Distance
PROXIM	Proximity Index		
MNN	Mean Nearest-Neighbor distance(m)		
NNSD	Nearest-Neighbor Standard Deviation (m)		
NNCV	Nearest-Neighbor Coefficient of Variation (%)		
MPI	Mean Proximity Index		

Fragstat		*Patch*/Habitat Analysis	
Indikator	Keanekaragaman lanskap (Diversity metrics)	Indikator	Keanekaragaman lanskap (Diversity metrics)
SHDI	Shannon's Diversity Index	MPI	Simpson's Diversity Index
SIDI	Simpson's Diversity Index	IJI	Interspersion Juxtaposition Index
MSIDI	Modified Simpson's Diversity Index	SDI	Shannon Diversity Index
PR	*Patch* Richness (#)	SEI	Shannon Evenness Index
PRD	*Patch* Richness Density (#/100 ha)		
RPR	Relative *Patch* Richness (%)		
SHEI	Shannon's Evenness Index		
SIEI	Simpson's Evenness Index		
MSIEI	Modified Simpson's Evenness Index		
Indikator Frgamentasi Lanskap (Contagion and interspersion metrics)		Indikator Frgamentasi Lanskap (Contagion and interspersion metrics)	
IJI	Interspersion and Juxtaposition Index (%)		
CONTAG	Contagion Index (%)		

Landscape index can be used as a proxy or surrogate indicator for biodiversity. The basic principles are as follow:

a) Patch (for example forest), the larger the patch, the more species it can hold. This is in line with the island biogeography theory that stated that biodiversity (S) correlates linearly with area (A) to the power of a constant (z), which value depends on the patch condition. The formula for mathematical equation is S = Az

b) Rounded patch will have more interior/core area, thus it can hold more interior species that elongated patch with similar size. On the other hand, elongated patch will have larger edge area, so that it can hold more edge species (Figure 6.5).

c) A landscape with more small patches will have a high fragmentation index. Such landscape will have high degree of isolation that causes high risk level of species loss.

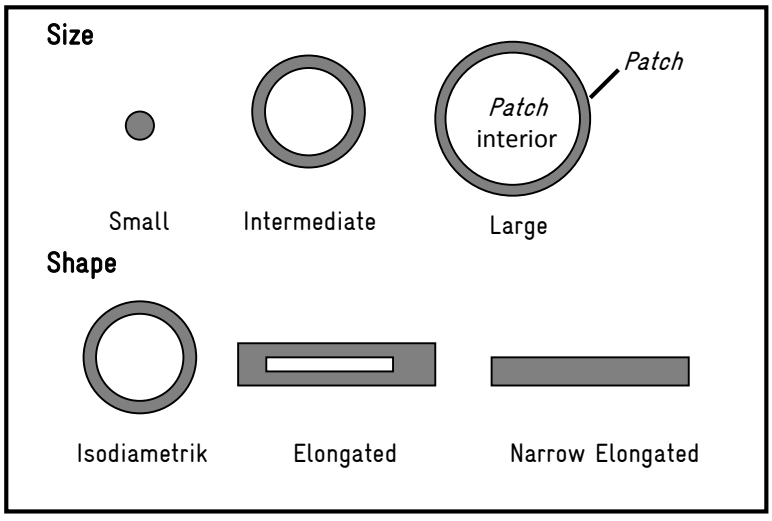

Figure 6.5. Interior and Edge based on size and shape of patch

VII. CRITERIA, INDICATOR AND PARAMETER MONITORING

Based on Landscape Ecology and DSIR approaches, the monitoring matrix structure of biodiversity in the Province of South Sumatra is presented in Tables 7.1–7.5. Criteria and indicators are arranged in tiers (hierarchical approach), from landscape level to community/ecosystem, population-species and genetics, adopting Noss' (2005) approach. Hierarchical approach is also selected to anticipate resource availability, both human resources and funding. In a very constrained condition the most macro criteria and indicator of biodiversity can be chosen, and if possible it can be done for all levels of criteria and indicators.

7.1. Matrix of Criteria, Indicator, & Monitoring Parameters of Biodiversity at Regional Landscape Level

An indicator at regional landscape level is the most macro indicator that is easiest and fastest to be monitored, which consists of physical condition, landscape condition (diversity and compactness), area status, threat and environmental services (Table 7.1). Physical criteria and indicator reflect natural diversity. Although indicator of physical condition is not sensitive to changes, this data is important to know as a foundation for a more detailed ecosystem classification that is important for the management of biodiversity. The criteria included in physical condition indicator are soil type, altitude, slope, climate (precipitation, temperature, and humidity), and geology and ecosystem type. Most of the basic data are secondary data that have been published by Research Institute of Soil and Agroclimate (Lembaga Penelitian Tanah dan Agroklimat), Geospatial Information Agency (Badan Informasi Geospasial) and other sources. In addition to topographical data from Indonesian topographic map (RBI) published by Geospatial Information Agency (BIG), data from Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM), or Advanced Spaceborne Thermal Emission and Reflection Radiometer Digital Elevation Model (ASTER GDEM) can also be used..

Indicator of ecosystem type can be arranged by integrating data on soil type, elevation, climate and geology or by referring to Land system data published by Geospatial Information Agency (BIG). The more diverse an ecosystem, the higher biodiversity is, because each ecosystem has its own unique flora and fauna.

Indicator of land cover/land use that is analyzed based on satellite image is the most consistent indicator and easily visible, by monitoring land cover/land use type and area size of each land cover/land use landscape biodiversity will already be known (Honnay et al 2003). The assumption in this approach is that the more diverse and the larger forest cover area, the higher its biodiversity level, which is in accordance with the theory of Island Biogeography from MacArthur& Wilson (1967), Simberloff & Abele (1976), Oertli et al 2000. On the other hand, the wider the artificial (man-made) land-cover, the lower its biodiversity will be. The theory of island biogeography can be formulated in the following equation, $S = Az$, where S is the biodiversity, A is the landscape area, z is a constant

whose value depends on the level of landscape diversity. The wider and the more diverse the elements of landscape components, the diversity will be higher.

The criteria of landscape diversity in this document refer to the diversity of elements composing the landscape, namely land cover diversity. The more diverse land-cover the higher the diversity, and the consequence is the more edge area; therefore, the level of species diversity is higher as a result of edge effect (Batary, 2014). However, such condition does not always mean an indication of a better condition, because more edge will decrease interior species if the composing elements have narrow areas that prevent occurrence of core area. Thus, another indicator is needed for comparison, namely Landscape Compactness.

The indicators of Landscape Compactness criteria are Landscape Shape, Degree of Isolation and Landscape Fragmentation. A more isodiametric a landscape element is better. The indicator of the degree of isolation can be seen from the variables of the number of forest patches, patch density, average size of forest patches and the size of the largest patch.

Other indicators are protection status, threat, and environmental services. The more forest landscape is protected, the better it is; the closer it is to the center of economic activity, the bigger the threat.

Table 7.1. Matrix of Criteria, Indicators & Parameters of Biodiversity Monitoring at Landscape Level

Level	Criteria	Indicator	Parameter/ Variable	Method/ Technique	Data Source
Landscape	Physical Condition	Soil Type	Area, Proportion & spatial distribution of peat land	GIS	Map of land and soil unit (Soil and Agroclimate Research & Development Center)
		Slope	Size, proportion and distribution of slopes	GIS	Topography/SRTM/Indonesian Topographic Map (RBI) (Geospatial Information Agency)
		Elevation	Area, proportion & spatial distribution of elevation	GIS	Topography/SRTM/Topographic Map (RBI) (Geospatial Information Agency)
		Climate	Precipitation, air humidity, temperature, air pressure, wind	Ihsoyet Normal-GIS approach	Daily/Monthly/Annual/ Climate Data (Indonesian Agency for Meteorology, Climatology and Geophysics)
		Geology	Rock bed type	GIS	Geological Formation Map (Research & Development Agency for Geology)
	Landscape condition	Ecosystem/ Habitat Type	Area, proportion & spatial distribution of habitat/ecosystem types	GIS/Remote Sensing	Land System Map (RePPProt/Geospatial Information Agency)
		Land cover type	Area, proportion & distribution of land cover	GIS/Remote Sensing	Satellite Imagery (landsat/SPOT)

Level	Criteria	Indicator	Parameter/ Variable	Method/ Technique	Data Source
		Land use type	Area, proportion & distribution of land use	GIS/Remote Sensing	Satellite Imagery (Landsat/SPOT), District/Provincial Land-use Map, Forest/Forest Area Function Map, Concession Area Map
	Landscape Compactness	Landscape Shape	Ratio Core/edge of forest area	GIS/Habitat Analysis/Fragstat	Satellite Image(Landsat/SPOT)
			Mean Shape Index	GIS/Habitat Analysis/Fragstat	Satellite Image(Landsat/SPOT)
		Degree of Isolation	Number of forest patches	GIS/Habitat Analysis/Fragstat	Satellite Image (Landsat/SPOT)
			Average size of forest patches	GIS/Habitat Analysis/Fragstat	Satellite Image (Landsat/SPOT)
			Largest Forest Patch Index	GIS/Habitat Analysis/Fragstat	Satellite Image (Landsat/SPOT)
			Density of forest edge	GIS/Habitat Analysis/Fragstat	Satellite Image (Landsat/SPOT)
		Landscape Fragmentation	Fragmentation Index	GIS/Habitat Analysis/Fragstat	Satellite Image (Landsat/SPOT)
			Contagtion Index	GIS/Habitat Analysis/Fragstat	Satellite Image (Landsat/SPOT)
Landscape	Area Status/ Protection	Forest Protection	Area, Proportion & Distribution of protected forest	GIS/Remote Sensing	Maps of forest area/function, Spatial Plans (RTRWK/P), Land cover
	Forest threat from human activities and Fires	Effect of Transportation	Road density (road length/area),River density	GIS	Topographic Map
			Forest distance from road	GIS	Topographic Map
		Effect of Land Use	Distance between forest and land use type	GIS	Topographic Map/Satellite Image (Landsat/SPOT)
		Effect of Forest Fires	Probability of forest fire	GIS/Remote Sensing	Satellite Image (Landsat/SPOT), hotspot
	Environmental Services	Provisioning service availability	Value of ratio of Qmax and Q min (maximum and minimum debit)	Hydrological Model /GIS	Precipitation, Number of Rain Days
			Value of Carbon Content	Remote Sensing, Allometry	Satellite Image (Landsat/SPOT), Field/Ground Survey

Level	Criteria	Indicator	Parameter/ Variable	Method/ Technique	Data Source
		Regulating service availability	Degree of erodibility (USLE formula), flood & temperature Rain Erodibility Index, Soil Erodibility Index , Land Slope Index, Land Cover Index, Land Cultivation Index	GIS/Remote Sensing, data of field measurement	Precipitation, number of rain-day, Soil& Land Unit Map, Topographic map/SRTM, Satellite Image (Landsat/ SPOT)

7.2. Matrix of Criteria, Indicators and Monitoring Parameter of Biodiversity at Habitat Level

Criteria of biodiversity at habitat level are the habitat quality and status (Table 7.2). Indicators to assess habitat quality are diversity, species distribution, forest stand condition, including flora and fauna. The criteria of habitat status are related to the threat indicator of important habitat for target species. The method to obtain such data and information is to conduct field survey (primary data).

Table 7.2. Matrix of Criteria, Indicator and Monitoring Parameter of Biodiversity at Habitat Level

Level	Criteria	Indicator	Parameter/Variable	Method/Technique	Data Source
Habitat	Habitat Quality	Species diversity	Diversity Index	Quantitative analysis	Primary Data, Field Survey
		Distribution of target Species	Evenness Index	Quantitative analysis	Primary Data, Field Survey
		Condition of forest stand	Forest vertical structure	Quantitative analysis	Primary Data, Field Survey
			Distribution of stand size	Quantitative analysis	Primary Data, Field Survey
			Stand density/density of forest cover	Hemiview, remote sensing/RS, GIS, GPS	Satellite Image data, Field Survey
			LAI (*canopy Openness*)	Hemiview, remote sensing/RS, GIS, GPS	Satellite Image data, Field Survey
			NDVI (*normalized difference vegetation index*)	Hemiview, remote sensing/RS, GIS, GPS	Satellite Image data, Field Survey
		Water Quality	Availability and Occurrence of Salt Lick	GIS/Remote Sensing, GPS	Satellite Image (Landsat/SPOT), Field Survey
		Distribution of feeding location	Availability and Occurrence of feeding location	GIS/Remote Sensing, GPS	Satellite Image (Landsat/SPOT), Field Survey

Level	Criteria	Indicator	Parameter/Variable	Method/Technique	Data Source
	Habitat Status	Degree of threat of suitable habitat for target species	Proportion of habitat suitable for target species both protected and non-protected	Habitat suitability analysis Gap analysis	Map of Forest Function.Forest Area, District and Provincial Land Use Map, Concession Area Map

7.3. Matrix of Criteria, Indicators and Parameter of Biodiversity Monitoring at Levels of Population & Gene

Indicators at the level of species and genes include (a) capability of an area in supporting sustainability of a species, (b) occurrence of invasive species, (c) species sustainability, and (d) cultural aspect (Table 7.3).

Table 7.3. Matrix of Criteria, Indicator & Parameter of Biodiversity Monitoring at species and genetic levels

Tingkat	Criteria	Indicator	Parameter/Variable	Method/Technique	Data Source
Species/ Population	Capacity of an area to support the survival of target species	Home range and habitat suitability	Distribution, area, proportion of home range of species target	GIS: Maximum Convex Polygon, Kernel Density, GPS: position marking	Primary data, Field Survey
			Distribution, area and proportion of area with high habitat suitability for target species	Habitat suitability index	
			Fragmentation of area suitable for target species	GIS /Spatial analysis, GPS: position marking	Primary data, Field Survey
	Occurrence of invasive species	Distribution of invasive species	Area, Proportion and distribution of invasive species	Quantitative/Qualitative Analysis	Primary data, Field Survey
	Sustainability	Species diversity and Evenness	Species richness (e.g. Margalef diversity)	Quantitative Analysis (Statistical)	Primary data, Field Survey
			Species evenness (e.g. Shannon Evenness Index)	Quantitative Analysis (Statistical)	Primary data, Field Survey
			Species diversity (Shannon diversity Index)	Quantitative Analysis (Statistical)	Primary data, Field Survey
			Dominance	Quantitative Analysis (Statistical)	Primary data, Field Survey
		Species function/role	Functional Group/Guild analysis	Quantitative Analysis (Statistical)	Primary data, Field Survey

Tingkat	Criteria	Indicator	Parameter/Variable	Method/Technique	Data Source
		Demography	Number of individuals	Quantitative Analysis (Statistical)	Primary data, Field Survey
			Composition (age, sex ratio, etc.)	Quantitative Analysis (Statistical)	Primary data, Field Survey
	Cultural aspect of biodiversity	Species utilization by community	Index of Cultural Significance (ICS)	Quantitative Analysis (Statistical)	Primary data, Field Survey
Genetic	Genetic Diversity	Genetic variation among individuals	Quantitative traits : Heritability	DNA Analysis	Laboratory observation
			Molecular traits : 1. Mutation 2. Natural selection 3. Migration 4. Random genetic drift 5. Non-random mating	DNA Analysis	Laboratory observation
		Genetic variation between populations	Haplo type	DNA Analysis	Laboratory observation

7.4. Monitoring Driver, Pressure & Response

Monitoring of DPSIR is organized to examine Driver and Pressure, and to what extent Response from stakeholders has been given. Table 7.4 shows a fill in form of several drivers and pressures that might happen in various places, based on some information sources/field. Table 7.5 is a form for identifying to what extent the Drivers and Pressures have been responded by Government/manager. It is expected that by analyzing this data stakeholders can monitor and identify various important drivers and pressures as well as formulation of necessary policy intervention/program (response).

Table 7.4. Monitoring of drivers of biodiversity change (Driver and Pressure)

Drivers	Pressure	Negative Impact	Time (when?)	Location (where?)	Source of information
Climate Changes	a. Sea surface increase Sea surface increase				
	b. Coral bleaching				
	c. Flood				
	d. Fire				
	e. Pollution				

Drivers	Pressure	Negative Impact	Time (when?)	Location (where?)	Source of information
Geological event	a. Tsunami				
	b. Earthquake				
	c. Other				
Economy					
I Foreign Direct Investment/Domestic Investment	Plantation Expansion				
	a. Forest Concession				
	b. Other				
MP3EI	Infrastructure				
	a. Development				
	b. Other				
Others Economic Crisis	a. Agricultural encroachment				
	b. Plantation expansion				
	c. Illegal logging				
	d. Unsustainable Exploitation				
	Other				
Penduduk/ Population Population	a. Infrastructure				
	b. Agricultural encroachment				
	c. Others				
Others					

Table 7.5. Monitoring of response from stakeholders at various management scale (Response)

No.	Scale	Response	How to address	How to monitor
1.	Global			
	National			
	Sub-national (province)			
	District			
	Local			
2	Global			
	National			

No.	Scale	Response	How to address	How to monitor
	Sub-national (province)			
	District			
	Local			
Etc.				

VIII. PROPOSE PROGRAM PRIORITY

The FGD in Palembang and Jakarta, including secondary data, showed a result that South Sumatera's deforestation is inevitable, even the existing condition still rose up significantly. The major drivers are illegal logging, agriculture conversion and others land use change. Today, South Sumatera landscape is covered by man-made dominated landscape. Which is, it trigger numbers of human-wildlife conflict (Afransayah 2014). Many wildlife animals is reported decreased even going to extinct, e.g. Sumatran Elephant, Sumatran Tiger, Sinyulong and unglen), meanwhile there is no qualified report yet for monitoring status of the endangered animals. Thus, the trend needs to be understood by doing assessments in policy, social, economy, cultural and society, ecology (landscape, habitat and population). The result can be used as baseline data, that store in a local database system, which is used to measure the program achievements by government and others stakeholder, that using criteria, indicators and measureable variables.

8.1. Policy Assessment

8.1.1. Biodiversity Conservation Policy Analysis

The biodiversity and habitat loss still continue, despite various policy/program/action has been taken by both the government and non-governmental organization. The failure/ineffectiveness of the policy can be caused by several things, such as (a) the policy mistaken due to inaccurate problem-solving action, (b) lack of coordination between agencies/systems, (c) policy overlapping and contradictive possibility, (d) lack of enforcement law, (e) lacking of incentive system in order to support conservation efforts in society. The aims of this study is to assess policy (response) at national level and South Sumatera level on biodiversity and efforts in conservation, spatial planning and land-cover.

The output of study are (a) an idea for national program/policy adaptation that should be conducted in order to increase the effectiveness of local biodiversity conservation management, (b) Gap analysis between biodiversity problems and its policy, and (c) recommendation for priority policy in a regional rules/act that needed Luaran studi ini adalah (a) saran terhadap adaptasi kebijakan/program nasional yang perlu dilakukan untuk meningkatkan efektivitas pengelolaan konservasi keanekaragaman hayati daerah, (b) Analisis kesenjangan antara persoalan berkaitan dengan keanekaragaman hayati dengan kebijakan yang telah dibuat, dan (c) Usulan kebijakan prioritas dalam bentuk peraturan daerah yang diperlukan.

8.1.2. Biodiversity Strategy and Action Plan Making for South Sumatera Province

Pada tataran nasional, telah diterbitkan beberapa Rencana Strategis dan Rencana Aksi Nasional (Renstra & RAN), seperti IBSAP 2003-2020, Renstra Gajah, Renstra Orangutan, Renstra Harimau, Renstra Mangrove, Renstra Kawasan Konservasi, serta Arahan Konservasi Spesies Nasional 2008-2018.

Supaya lebih operasional sesuai dengan konteks pemerintah daerah, maka perlu disusun Rencana Strategis dan Aksi Keanekaragaman Hayati pada tingkat provinsi. Hal ini juga telah dimandatkan oleh CBD. Tujuan dari kegiatan ini adalah Penyusunan Rencana Strategis dan Rencana Aksi Keanekaragaman Hayati Provinsi Sumatera Selatan. Luaran dari kegiatan ini adalah Rencana Strategis dan Rencana Aksi Keanekaragaman Hayati Provinsi Sumatera Selatan, yang disusun secara partisipatif dengan melibatkan berbagai pemangku kepentingan.

8.1.3. Strategic Environment Assessment and South Sumatera Spatial Planning

At national level, Strategic Plan and National Action Plan have been published, e.g. IBSAP 2003-2020, Elephant Strategic Plan, Orangutan Strategic Plan, Tiger Strategic Plan, Mangrove Strategic Plan, Conservation Area Strategic Plan and National Species Conservation Instruction 2008-2018. In order to reliable with local condition, a regional/province biodiversity strategic and action plan needed to be developed. This is also a mandatory action of CBD. The aim of the activity is to make the biodiversity strategies and action plans of South Sumatera Province. The output is South Sumatra Biodiversity Strategic and Action Plan, that participatory involving various stakeholder.

8.1.4. Parliament Forum Establishment

Policy intervention in supporting the biodiversity program in sub-national (provincial) need to be supported by a regional institution based advocacy. One of the local institutions that essential to be initiated is the regional parliamentary forum both at the provincial and district level. The purpose of the forum is to design, to monitor, and to advocate the local rules and policies in mainstreaming biodiversity. Activities that can be supported through this forum is to support local biodiversity policy advocacy through legislation initiative procedure of council/parliament. By institutional, the forum can consists of policy makers /commissioners IV DPRD (committee for agriculture, farming, forestry, marine, fisheries, and food), executive secretary of the forum, as well as community leaders and NGOs. The purpose of this program is to facilitate the forum establishment and to provide advocacy on biodiversity issues. The output is an establishment of a parliamentary forum that aware on biodiversity conservation issues.

8.2. Assessment in Social, Cultural, Economy and Education Program

8.2.1. Baseline Survey in Economy, Social, and Cultural of Community Who Can Access the Natural Resources Survey Baseline

South Sumatra residence that has access to local natural resources (forest) consists of 3 groups, they are indigenous people, Malay migrant communities, and trans-migrant. Each community has different criteria and wisdom in accessing and utilizing natural resources. To respond these conditions, the stakeholder should conduct an holistic data collection activities in order to provide and mapping

the real condition of society properly. The output is a recent evidence that can be used as a reference to determine the policies and regulations in accessing local biodiversity, especially emphasis on sustainable use.

8.2.2. Conflict Mapping between Community and Wildlife Animal, including Community Mitigation and Adaptation Efforts

Loss and fragmentation of nature forest into artificial ecosystem (man made ecosystem) such as agriculture, farming and settlement, caused the decreasing wildlife habitat. This condition triggers the conflict between the people and wildlife. Most conflict cases were solved by killing the animal, due to it harmful for human. Meanwhile, human decisions itself bring negatively impact on species population, even ended on species extinction. To address this, the biodiversity management in man-made dominated landscapes is needed. Thus, it requires various information of the potential conflict area. The purpose of this mapping is (a) to study the distribution of conflict potential spatially, (b) to formulate conflict mitigation efforts, (c) to support the adaptation of society. The output are (a) Map of conflict between the people and wildlife, and (b) the formulation of conflict mitigation and adaptation efforts of the community.

8.2.3. Assessment of Protection Area Encroachment

Habitat loss is the greatest threat to biodiversity. One driver of the habitat loss is encroachment activities. To address it, the study/assessment on direct causes (pressure) and indirect causes (driving force) of encroachment is needed, as a proper evidence for policy making. The aims of this study are (a) to identify the pressure and driving force of encroachment in forest areas, (b) to support policies in reducing the encroachment. The output of the study is a map of the encroachment distribution, causes and policy handling alternativesMainstreaming Biodiversity into Basic Education

Education is a tool for human character building. Human alignment, as actors and users of biodiversity needs to be managed into a pathway of natural resources utilization wisely and sustainable. To that end, biodiversity mainstreaming in all education level is an important pillar of sustainable development. To address the theme, introduction of the biodiversity in the local curriculum (muatan lokal daerah) can be proposed. The aim of this program is to enhance student knowledge on region diversity, as well as forming and raising their character on biodiversity awareness, so that the sustainability of biodiversity can be guaranteed. The output of the program is (1) student awareness on biodiversity and its maintenance efforts, and (2) the book/modules, posters of environmental education/biodiversity conservation.

8.2.4. Biodiversity Management Collaboration : Citizen Science and Monitoring Participative System Approach

Biodiversity mainstreaming can be proposed through a Citizen Science Approach. Citizen Science is a new pathway that can support the public involvement on the conservation of biodiversity. The aim of this program is to provide environmental education to the community about biodiversity conservation and assist the monitoring of biodiversity. The output of the activity is (a) the documents of community advocacy process, (b) public awareness on biodiversity conservation increased.

8.2.5. Community-Private Partnership Formation

The initiation of sustainable biodiversity management can be conducted by two stakeholders, i.e. the community and the private sector. Collaboration between the two actors is a potential pillar for biodiversity efforts that can be developed in local. By using the Corporate Social Responsibility/CSR scheme, the partnership is not merely support the conservation, but also for local economic development. A good designed of CRS CSR program is expected to reduce human illegal activities in the forest. Through the program, communities can be strengthened using others income source e.g. agriculture, agroforestry and livestock. The impact of this, the people's dependence on forest products (timber), wildlife hunting and encroachment can be decreased. The purpose of the program is to support biodiversity conservation management through the establishment of Community-Private Partnership.

8.3. Landscape Ecological Assessment

8.3.1. Structure Landscape Changes and Its Impacts on Biodiversity

Habitat condition is the fastest proxy to determine the condition of biodiversity in area. Landscape conditions that compact is better than the fragmented condition. Analysis of landscape multi-time change will able to provide a trend of biodiversity condition, wheter it increase or decrease. Further analysis can be focused on habitat connection with traits/bioecology each species, thus the most vulnerable species can be identified. The study was conducted by using moderate or high resolution satellite imagery. The aim of the study is to analyze the landscape change in the past 20 years and to monitor its impact on biodiversity. The output of this study are: (i) Land cover in the last 20 years, (ii) biodiversity in the various landscape/land cover.

8.3.2. Corrridor Development study that linked the Fragment of Protection/Conservation Area

Habitat condition is the fastest proxy to determine the condition of biodiversity in area. Landscape conditions that compact is better than the fragmented condition. Analysis of landscape multi-time

change will able to provide a trend of biodiversity condition, wheter it increase or decrease. Further analysis can be focused on habitat connection with traits/bioecology each species, thus the most vulnerable species can be identified. The study was conducted by using moderate or high resolution satellite imagery. The aim of the study is to analyze the landscape change in the past 20 years and to monitor its impact on biodiversity. The output of this study are: (i) Land cover in the last 20 years, (ii) biodiversity in the various landscape/land cover.

8.3.3. Habitat Vulnerability on Fire and Oil and Gas Exploitation Accident

Important habitat in South Sumatra has fragmented into remnant patch that very vulnerable to expose on fire and accident exploitation /distribution of oil and gas. The aim of this study is to develop a map of key vulnerability habitat from forest/land fire and the accident in oil and gas exploitation/distribution. The output of the study is a map of vulnerability that can be used by stakeholder in management priority based. Habitat vulnerability map also can be used for recommendation in spatial management/block or working concessions area (HTI, plantations and mining), as well as opportunities for the development of wildlife corridors.

8.3.4. Mapping the Suitability Habitat for Tiger and Elephant

The home range of elephants and tigers are very wide, and has been fragmented. The aim of this study was to develop both tiger and elephant suitability habitat map. The outputs of the study are (i) a map of habitat suitability (ii) a map of the potential conflicts that may occur. The results of this mapping will be overlaid with maps of RTRWP/K and a map of the concession areas (HTI, plantation and mining) that can be used for policy planning and evaluating the policy implementation. This study is to look at the concession area dispersion for key species habitat suitability. Additionally, the map can be used recommendations for spatial/block planning or working concession areas (HTI, plantation and mining), as well as opportunities for the development of a wildlife corridor.

8.3.5. Environmental Service Assessment with focusing on Provider of Water and Carbon

Conservation /protection of fragile ecosystems are very important, this is not merely for biodiversity but also for the environmental services provided. The purpose of this study is to determine the value of water and carbon environmental services in several important ecosystems including peat forests, mangroves and dry forest.

8.4. Study in Habitat Level Program

8.4.1. The Habitat Qualities (Density, Age/Size Distribution) in Fragmented Forest

Remnant habitat has been fragmented for a long time, thus it needs to be studied its quality. The purpose of this study is to value the remnant habitat (secondary forest/bush). The output of the study is a proposed restoration for remnant habitat.

8.4.2. Mapping the Location Distribution for Feed and Salt Area of Priority Wildlife

Habitat is a place for animals/wildlife living, moving, and foraging for feed and drink (salty), which is different in each location. The purpose of the study is to develop a map of the distribution of the feed source and salty animal priority. The output of this study are (i) a map of the feeding location distribution, (ii) the vulnerability potential map for the food location.

8.5. Study in Protected Species/Population

The information in population condition of elephants, tigers, hornbills, gibbons and protected flora is very important for management. The purpose of this study is to assess the condition of the population of tigers, elephants, hornbills, gibbons and protected flora in a variety of remnant habitats.

8.6. Program Database and Information Program

8.6.1. Database and WEB GIS Management

Based on FGD 1 in Palembang and FGD 2 in Jakarta FGD 2 has been informed that various numbers of biodiversity related-research have been conducted in South Sumatra by researchers, NGOs, private sector and universities. The information is scattered in many places, thus it is difficult to access quickly by public or policy makers. Furthermore, it is necessary to develop an open database and information and can be seen quickly. The output of this program are (a) a database of biodiversity in South Sumatra, (b) WEB GIS of biodiversity South Sumatra, (c) network system set up for South Sumatra data collection.

8.6.2. The Biodiversity Collaboration Secretariat Establishment

Decentralization that initiatived by the central government since the reforms has affected natural resource management area. The authority of the centralized management of natural resources shifted into the legitimacy of regional (local), both the power and policy and legislation region's natural resources. Changing in the power authority on area management also urges local economic self-support. To fulfill the condition, natural resources areas in provinces/districts are the main economic source. In the other hand, the area is also a working space for other development actors both pro-

environment and economic based natural resources oriented. The various actors evolve different interests on natural resource thus affect the access and use of natural resources. In line with this, the facts present, globalization is a tremendously thing and faced by local governments. Environmental and global biodiversity agenda is inevitable. Both agenda has shaped the local program. To address the change, the harmonization in development agenda and regulatory is absolutely necessary. To that end, local governments need to provide a system for the discussion of local development actors. The purpose of this program is to establish room in sharing information to support the formation of understanding and mutual agreement in conducting regional development agenda as well as supporting the global agenda. The output is the establishment of collaboration secretariat and harmonization of regional development programs and activities among stakeholder.

IX. CLOSING REMARK

Landscape Ecology approach is an approach to biodiversity conservation by considering the structure and functions of the elements of the landscape. This approach is the easiest, quick and consistently as the approach employ remote sensing data. The approach is suitable for broad scale and long-term biodiversity monitoring. The assumption behind the approach is that if the structure and function of both the biodiversity landscapes in good condition. One advantage of this approach is the ease monitor landscape dynamics of each element forming the landscape changes, so as to know the cause, which can then be analyzed with the DPSIR approach. DPSIR approach is a framework linking biodiversity with the policy / program stakeholders. DPSIR approach is the principle of the conservation of biodiversity to understand the role of Drivers, Pressure, and Impact, in order to take the policy / program (Response) right. This approach differs from previous approaches biodiversity conservation that only targets for protected species only.

This document is a compilation framework of indicators and parameters of weeks to biodiversity monitoring openly organized, which absorb the aspirations of stakeholders from local government, private sector, NGOs and universities. This document is expected to be a common reference for the parties / stakeholders in determining the criteria, indicators and variables that need to be measured in biodiversity conservation research activities in the province of South Sumatra. This will make it easier for managers to compile a database of biodiversity, as a basis for the formulation of policies / programs. It is well known that the success of biodiversity conservation in South Sumatra province relies heavily on the cooperation and support of all parties.

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