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# SOCIO-ECONOMIC VULNERABILITY ASSESSMENT & BASELINE STUDY

for theGIZ BIOCLIME Program in South Sumatra, INDONESIA

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# Abbreviations

| | |
|---|---|
| ***BAPPEDA*** | Regional Development Planning Agency (Badan Perencana Pembangunan Daerah) |
| ***BAPPENAS*** | National Development Planning Agency (Badan Perencanaan Pembangunan Nasional) |
| ***BPS*** | National Statistics Agency (Badan Pusat Statistik) |
| ***BIOCLIME*** | Biodiversity and Climate Change Program |
| ***BMKG*** | Meteorology, Climatology and Geophysics Board (Badan Meteorologi Klimatologi dan Geofisika) |
| ***BPBD*** | Regional Disaster Management Strategy |
| ***CBA*** | Community Based Adaptation |
| ***CIFOR*** | Center for International Forestry Research |
| ***CVCA*** | Climate Vulnerability Capacity Analysis |
| ***DIBI*** | Indonesian Disaster Data and Information (Data dan Informasi Bencana Indonesia) |
| ***DRR*** | Disaster Risk Reduction |
| ***FGD*** | Focus Group Discussion |
| ***FMU*** | Forest Management Unit |
| ***GoI*** | Government of Indonesia |
| ***GIZ*** | German International Co-operation |
| ***IDR*** | Indonesian Rupiah |
| ***IPCC*** | Intergovernmental Panel on Climate Change |
| ***KfW*** | KfW Development Bank, Germany |
| ***MoFor*** | Ministry of Forestry |
| ***MoFin*** | Ministry of Finance |
| ***NGO*** | Non-Governmental Organisation |
| ***NRM*** | Natural Resources Management |
| ***REDD*** | Reduced Emissions from Deforestation and Forest Degradation |
| ***Rp*** | Indonesian rupiah |
| ***SLA*** | Sustainable Livelihood Approach |
| ***UNFCCC*** | United Nations Framework Convention on Climate Change |
| ***USD*** | United States dollars |

# I. Introduction

## A. About the Study

1. Peter Mackay was commissioned by GIZ to prepare a '**Socio-Economic Vulnerability Assessment and Baseline Study**' for the Biodiversity and Climate Change Program (BIOCLIME) in South Sumatra, Indonesia. The study was undertaken in the Regencies of Musi Rawas, Musi Banyuasin and Banyuasin in Sumatra Selitan between February and July 2014.

2. The objective of the study was to develop a set of comprehensive baseline demographic, social and economic indicators in both beneficiary and non-beneficiary villages for the BIOCLIME Project. These indicators are to be used to analyze the vulnerabilities (social, economic and environmental) of 'forest management areas' including in areas of production forest; protection forest, and protected areas.

## B. Background to the Project

3. The GIZ Forests and Climate Change Program (BIOCLIME) commenced in February 2014, with the aim of conserving areas of high biodiversity conservation value and carbon storage capacity in South Sumatra. To achieve this goal, GIZ will assist the Indonesian Government to design and implement legal, policy and institutional reforms for conservation and sustainable management of forests at local, provincial and national levels in South Sumatra so as to:

i. Identify trends and factors related to the decline in biodiversity(both within and outside protected areas);
ii. Develop concepts for appropriate measures for the conservation, rehabilitation and management of peat forest and related high conservation ecosystems of in South Sumatra;
iii. Develop future management models which ensure high ecological sustainability, and increase the capacity of local people and communities to adapt to climate change (including the design and implementation of income generating activities; help reduce illegal activities;

iv. Improve the measurement, monitoring, reporting and verification (MRV) of the local contributions to the national GHG reduction targets); and

v. Ensure that relevant local stakeholders, communities and institutions are supported by appropriate capacity building and development activities and measures.

4. The project not only contributes to the achievement of biodiversity targets in Indonesia under the Convention on Biological Diversity and the Framework Convention, but also to meeting Indonesia's climate change mitigation and adaptation targets under the Framework Convention on Climate Change (UNFCCC) to reduce its greenhouse gas emissions by 2020.

5. In this context, it is envisaged that the BIOCLIME program will make a significant contribution to climate mitigation targets in Indonesia through the development of a range of pilot demonstration sites and measures for achieving REDD+ outcomes by focusing on:

- The reduction and fragmentation of important habitats and areas of high biodiversity conservation areas slowed in the intervention areas of the project.
- Carbon storage capacity of selected forest ecosystems in the intervention areas of the project is obtained.
- Sustainable protection and management concepts for selected forest ecosystems in the intervention areas of the project are approved by the competent authorities with the participation of relevant stakeholders.
- The data collected in the intervention areas for carbon sequestration and emission reduction are incorporated into the calculation of the contribution of the relevant districts and the province to achieve national GHG reduction targets with respect to the agreed reference level.
- Increased capacity of local government institutions and communities (relevant stakeholders) to plan and implement participatory conservation and management concepts and activities.
- Alternative sources of income for protected areas are developed and promoted for communities living in core and buffer zones.

# C. The Study Area

## 1. Location

6. The project is located in the north part of the province of South Sumatra, adjacent to the province of Jambi to the north. Administratively this province is divided into eleven regencies, of which the Project has identified target areas in 3 regencies, these being Musi Rawas, Musi Banyuasin and Banyuasin regencies.

*Figure 1 Project Location Sumatera Selatan Administrative Divisions*


## 2. Target Groups & Areas

7. The target groups of the project are regional and local decision-makers, communities and user groups, and are discussed below. GIZ will work with key partners and stakeholders in each district, including regional and local government agencies, local communities, concessionaires, as well as a number of potential NGOs and research partners.

8. The target areas also includes a number of protected areas including: Merang Peat Swamp Forest area (MPSF) which is a promising location for such a pilot project due to the still relatively intact forest cover and the large below ground carbon storage in the peat, as well as the suitable location

with connections to the protected areas of Sembilang National Park in Banyuasin and Kerinci Seblat National Park in Musi Rawas Regency.

9. GIZ will specifically focus on developing an approach for the protection and sustainable management of forests of high conservation value that is acceptable to local people, the private sector and policy makers. Improved forest management including restoration of natural degraded forest will only be achieved if tangible economic incentives are provided in conjunction with meaningful environmental and social safeguards, including upholding the rights of local communities.

10. GIZ recognize that unless the local communities benefit then REDD+ is unlikely to work. By exploring the links the project will aim to help the many poor forest dwelling communities in project area.

11. It is proposed to establish several 'forest management units' (FMUs) in the districts, covering the full range of designated state forest types: production forest; protection forest; and protected areas. This study will assist in determining both the target areas and beneficiaries for the project.

# II. Research Methods

## A. Baseline Survey

### 1. Overview

12. GIZ engaged two survey teams from the University of Sriwijaya and the Zoological Society of London (ZSL) to conduct Village and Household surveys in 20 villages within Musi Rawas, Musi Banyuasin and Banyuasin Regencies between April and June 2014 (as summarized in Table 1 over page). The villages were selected on the basis of their:

- Proximity to conservation areas, protection forest and production and/or restoration forest in the buffer zones of the key biodiversity conservation areas in the project area;
- Village origin (indigenous, transmigrassi, sector related (oil & gas, plantation etc.) and/or illegally established villages; and
- Level of threat posed by the village to/or from biodiversity conservation and forest management activities (such as incursion into conservation areas – or restricted access to natural resources from forest protection measures).

### 2. Objectives

13. The objective of the study was to develop a set of comprehensive baseline demographic, social and economic indicators in both beneficiary and non-beneficiary villages for the BIOCLIME Project.

14. These indicators are to be used to analyze the vulnerabilities (social, economic and environmental) of 'forest management areas' including in areas of production forest; protection forest, and protected areas.

*Table 1 Summary of Villages Surveyed*

| Regency | Name of Villages | Sub-District | Protected Area | Proximity | Origin | Level of Threat |
|---|---|---|---|---|---|---|
| **Musi Rawas** | Karang Panggung | Selangit | TNKS | Very close | Local | High |
| | Marga Puspita | Megang Sakti | KPH Lakitan | Close | Local, migrant | High |
| | Napal Licin | Ulu Rawas | TNKS | Very close | Local | High |
| | Kelumpang Jaya | Nibung | HPT | Close | Local, migrant | High |
| | Tanjung Agung | Karang Jaya | TNKS | Close | Local | High |
| | Muara Kuis | Ulu Rawas | TNKS | Very close | Local | High |
| **Musi Banyuasin** | Macang Sakti | Sanga Desa | Harapan Rainforest | Close | Local, migrant | High |
| | Sako Suban | Batanghari Leko | Harapan Rainforest | Very close | Indig (SAD), local | High |
| | Pangkalan Bulian | Batanghari Leko | SM Dangku | Close | Local | High |
| | Bukit Sejahtera | Batanghari Leko | SM Dangku | Very close | Trans | Average |
| | Pagar Desa | Bayung Lencir | Harapan Rainforest & HTI | Close | Indig (SAD) , local | High |
| | Mangsang | Bayung Lenchir | SM Bentayan, HP Mangsang Mendis | Close | Migrant | High |
| | Muara Medak | Bayung Lencir | HD Muara Merang | Close | Migrants (mix) | High |
| | Kepayang | Bayung Lencir | HRG Merang Kepahiang | Close | Local, migrant | High |
| **Banyuasin** | Sungsang IV | Banyuasin II | TN Sembilang | Very close | Local | High |
| | Muara Sungsang | Banyuasin II | TN Sembilang | Close | Local mix | High |
| | Karang Anyar | Muara Telang | Hutan Lindung Pantai | Close | Local | Average |
| | Purwodadi | Pulau Rimau | TN Sembilang | Close | Local mix | Average |
| | Majuria | Banyuasin II | TN Sembilang | Close | Local mix | High |
| | Timbul Jaya | Air Saleh | Hutan Lindung Pantai | Close | Trans | High |

### 3. Data Collection Methods

15. The survey was designed to collect quantitative baseline information at the household and individual level and more qualitative data at the community level. Three different data collection methods were adopted to serve this purpose:

I. **Desktop Review**: - A desk review of the secondary data available for each survey site;
II. **Key Informant Interviews**: - Interviews with the relevant provincial government agencies and research institutions to assess data location, accuracy and relevance for socio-economic vulnerability related to declining biodiversity, forest resource degradation and the impacts of climate change.
III. **Village and Household Survey Questionnaires**: to assess baseline conditions at the village level, and provide an insight into the population, poverty, livelihood, social and bio-physical vulnerabilities; and the use of forest and other natural resources in the village; current agriculture and forestry practices; and knowledge and understanding of forestry and climate change adaptation.

16. Quantitative information on socio-demographic characteristics of Sub-Districts, economic aspects, the sources and patterns of livelihoods etc. was collected, as well as qualitative information on people's perceptions and attitudes on biodiversity conservation, climate change, and forestry via the household questionnaire.

17. Sampling was undertaken randomly in order to be statistically representative at both sub-district and Regency levels. Households were selected randomly, at a sampling intensity of between 2 to 5%, or a minimum of 20 of households being surveyed in each village.

## B. Vulnerability Assessment

18. There are multiple ways that can be used to identify communities, households and individual groups that are potentially 'vulnerable' to climate change. For the purposes of this study have adopted a community-based approach to evaluate the comparative socio-economic vulnerability of each community (and their natural resources) to climate change and other natural hazards.

19. In this context, **'socially vulnerable communities**' are defined as those communities who may be aware of the threat climate change, but lack access to resources to prepare for, or cope with the impacts of climate change. Similarly, '**economic vulnerability**' can be evaluated in terms of the potential impacts of climate hazards on household assets and livelihood systems. Economically vulnerable households and communities are those that are highly reliant on the natural resource

base that underpins its livelihood system, and generally have few viable livelihood alternatives or options, which is usually shaped by the availability of resources, together with local customs, land tenure systems and economic opportunities (availability of demand, and access to market etc.).

20. As mentioned previously, the overall objective of this study was to develop a comprehensive set of baseline demographic, social and economic indicators in both beneficiary and non-beneficiary villages for the BIOCLIME Project. These indicators are to be used to analyze the vulnerabilities (social, economic and environmental) of villages and communities in Musi Rawas, Musi Banyuasin and Banyuasin Regencies, including in areas of production forest; protection forest; and protected areas.

21. In order to achieve this, we developed a relatively straight forward methodology for evaluating the different aspects of socio-economic vulnerability at the household and village levels. Table 2 (over page) provides a summary of the framework we used to determine socio-economic vulnerability at the household level to external stress (such as climate change and climate related hazard).

22. This framework is extremely simple in that it entails only minor extension of the standard approach to establishing a socio-economic baseline for a project. Generally, in this context vulnerability is seen as the outcome of a mixture of environmental, social, cultural, institutional, and economic structures, and processes related to exposure to hazards, shocks and external stresses, and the ability to cope with or adapt to these risks. It involves the analysis of 5 dimensions of vulnerability, comprising a range of economic, social, environmental (biodiversity) and climate change indicators that can be quantified through a combination of primary data (field surveys) and secondary data (official statistics and reports).

23. From this perspective, the degree of vulnerability of an individual, households or community is determined by their exposure to the risk factors and their ability to cope with or withstand stressful situations. And in this context we use the sustainable livelihoods approach (SLA) to determine the relative vulnerability of rural livelihoods across the study area to various sources of stress, including population pressure, poverty, food security and livelihoods as perceived by survey participants, so as to understand people's resilience and adaptive capacity. The term 'livelihood' includes capabilities, assets (including both material and social resources) and activities utilized by a household for a means of living. A household livelihood is considered to be vulnerable when it cannot cope with or recover from stresses and shocks to its capabilities and productive asset base.

*Table 2 Vulnerability Assessment Framework*

| Vulnerability Indices | Vulnerability Indicator |
|---|---|
| **Social vulnerability** | • Population demographics (population density, age structure, growth rates, size of households etc.).<br>• Population characteristics (ethnicities, minority groups, gender etc.).<br>• Village/Household characteristics (leadership and decision making etc.). |
| **Economic vulnerability** | • Number and % poor and near poor households.<br>• Household Incomes |
| **Livelihood Vulnerability** | • Household land use.<br>• Livelihood systems composition (diversity of occupations and income streams). |
| **Ecological vulnerability** | • Conservation areas and protected forests.<br>• Levels of deforestation and degradation<br>• Threats from shifting agriculture, plantation development, illegal logging and hunting etc. |
| **Climate vulnerability** | • Climate change hazards and impacts (flooding, inundation, drought, erosion etc.).<br>• Susceptibility of livelihoods to the impacts of climate change (damage to crops, declining yields etc.).<br>• Current resilience and adaptive capacity. |

24. The Vulnerability Assessment Framework is an expert-opinion method, for evaluating physical/demographic, social, economic and environmental vulnerability at local, level based on existing socio-economic conditions at the village and household levels and 'existing risk" as identified by households and communities in the household survey. Using this framework we were able to analyze and rank vulnerability on a site by site basis. Each type of vulnerability is characterized by a number of physical/demographic, social, economic and environmental indicators.

25. It is important to understand that our approach differs from a standard socio-economic baseline assessment in two main areas. Firstly, vulnerability assessments are by definition, explicitly forward-looking and take account of potential future changes in vulnerability resulting from climate change (whereas baseline surveys are static in time, representing a single snapshot of the current socio-economic conditions).

26. Secondly, a vulnerability assessment approach differs in that it focus on changes in both natural and human systems over time, and hence ensures that vulnerability is interpreted on the assumption that interactions between human livelihood systems and environmental systems are reciprocal and interdependent - and that different human-environment systems vary in their vulnerability to external stresses, as they differ in terms of their resilience (how they currently respond to or avert the effects of climate change) and their adaptive capacity (i.e. capacity to adapt to the future impacts of climate change).

27. Another distinctive feature of our approach is the level or scale of analysis. We examine the variation in social and economic vulnerability to environmental and climate change risk at the level of the individual household level – and collectively at the village or community level using similar indicators for both levels of analysis. We have opted for these two levels to gain a better understanding not only of the fundamental, site specific vulnerabilities of each village but also of their collective resilience and adaptive capacity.

28. Collectively, community level resilience and adaptive capacity can be thought of as the ability of a community to resist, absorb, recover from, and adapt to effects of climate change. Broadly speaking, 'resilience' is the inverse of vulnerability - resilient communities have learnt to adapt to, and cope with the effects of climate change, and thereby reducing their vulnerability and risk – and adaptive capacity is the ability of a community to adjust, modify or change its characteristics or actions to mitigate the potential impacts of climate change, or to enhance the ability of a community to cope with the consequences of climate change.'

# III. Results

## A. Population and People

### 1. Regional Population

29. Sumatera Selatan (South Sumatra) province is located towards the southern end of Sumatra, and has an area of 91,592.43 km$^2$ and a population of 7,450,394 and population density of 81 people/km$^2$ (2010 census). Administratively the province is divided into eleven Districts (Regencies), including the three target Regencies of Musi Rawas; Musi Banyuasin; and Banyuasin.

*Table 3 Regency Population Statistics*

| Regency | Population | Area (km$^2$) | Population Density | Sub Districts | Villages |
|---|---|---|---|---|---|
| **Banyuasin** | 749,107 | 12,142 | 63.73/km$^2$ | 19 | 288 |
| **Musi Banyuasin** | 562,584 | 14,477 | 40.57/km$^2$ | 14 | 223 |
| **Musi Rawas** | 524,919 | 12,134 | 44.78/km$^2$ | 21 | 268 |
| **TOTALS** | 1,836,610 | 38,753 | | 54 | 779 |

*SOURCE: Sumatera Selatan Statistics Report 2010*

30. The population growth rate of the province was +1.85% (for the period 2000 to 2010), and the population is projected to grow to around 9,350,000 by 2030.

*Figure 2 Sumatra Selatan Population Change*


*SOURCE:* http://www.citypopulation.de/php/indonesia-admin.php

31. Figure 2 highlights the rate of population change between 2005 and 2010 at the District level for the Province. Musi Banyuasin District is growing at a rate of more than 5%, whilst Musi Rawas District and Banyuasin District are growing at between 0 and 2% respectively.

## 2. Demographically Vulnerable Groups

32. Demographically vulnerable communities or groups are those that, because of their particular demographic or social characteristics, are more vulnerable than others in the broader community.

*Table 4 Household Population Demographics*

| Regency | Name of Villages | Village Population | Number of Households | Persons per Household | Village Area (ha) | Population Density |
|---|---|---|---|---|---|---|
| **Musi Rawas** | Karang Panggung | 1,228 | 322 | 5.5 | 4,100 | 3.8 |
| | Marga Puspita | 1,273 | 378 | 3.5 | 1,649 | 3.4 |
| | Napal Licin | 3,064 | 768 | 4.5 | 1,923 | 4.0 |
| | Kelumpang Jaya | 1,936 | 337 | 4.5 | 725 | 5.7 |
| | Tanjung Agung | 1,827 | 456 | 5.5 | 2,806 | 4.0 |
| | Muara Kuis | 1,443 | 370 | 4.5 | 1,021 | 3.9 |
| **Musi Banyuasin** | Macang Sakti | 1,289 | 271 | 4.5 | 1,000 | 4.8 |
| | Sako Suban | 1,241 | 329 | 4.5 | 14,000 | 3.8 |
| | Pangkalan Bulian | 2,181 | 485 | 5.5 | 554 | 4.5 |
| | Bukit Sejahtera | 1,203 | 482 | 3.5 | 900 | 2.5 |
| | Pagar Desa | 883 | 220 | 3.5 | 88 | 4.0 |
| | Mangsang | 10,410 | 2,057 | 4.5 | 12,000 | 5.1 |
| | Muara Medak | 18,299 | 1,432 | 4.5 | 65,500 | 12.8 |
| | Kepayang | 2,324 | 523 | 5.5 | 13,288 | 4.4 |
| **Banyuasin** | Sungsang IV | 4,782 | 1,191 | 7.6 | 18,875 | 4.0 |
| | Muara Sungsang | 2,160 | 2,610 | 5.0 | 7,423 | 0.8 |
| | Karang Anyar | 3,631 | 4,625 | 4.8 | 10,000 | 0.8 |
| | Purwodadi | 1,234 | 1,234 | 4.1 | 1,727 | 1.0 |
| | Majuria | 1,452 | 1,452 | 4.8 | 1,518 | 1.0 |
| | Timbul Jaya | 1,367 | 1,367 | 4.1 | 2,100 | 1.0 |

*SOURCE: Household Survey*

33. Table 4 provides a summary of the population distribution by village in the study area, and describes the demographic profile of respondents and the household demography in the study area. The average family size was 4.3 persons per family in the study area. This is not considered to be high and is probably reflective of the socio-economic status composition of the areas surveyed.

34. With regard to age structure, the general population of Sumatra Selatan is proportionally very young, with over 30% of the population being under 30 years of age. From the households surveyed, approximately 35% of the population are under the age of 17 Years old (as illustrated in Table 5 below). Combined with relatively high growth rates and the prevalence of multiple family households would imply that population pressure on land resources into the future could be problematic, even though population densities are relatively low.

*Table 5 Population age structure*

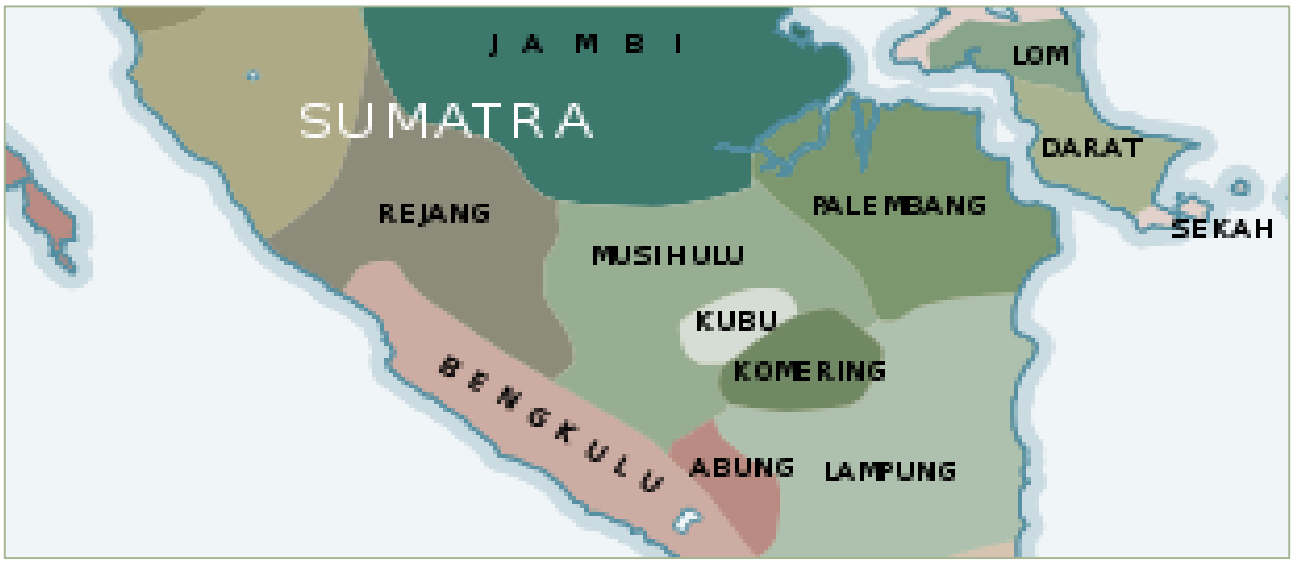
| Regency | Name of Villages | Male 0-16 | Male 17-54 | Male 55+ | Female 0-16 | Female 17-54 | Female 55+ |
|---|---|---|---|---|---|---|---|
| **Musi Rawas** | Karang Panggung | 32.61 | 65.22 | 2.17 | 40.48 | 59.52 | 0 |
| | Marga Puspita | 36.84 | 52.63 | 10.53 | 25.81 | 67.74 | 6.45 |
| | Napal Licin | 17.07 | 53.66 | 29.27 | 16.67 | 60 | 23.33 |
| | Kelumpang Jaya | 32.35 | 64.71 | 2.94 | 43.9 | 51.22 | 4.88 |
| | Tanjung Agung | 20 | 68.57 | 11.43 | 31.91 | 61.7 | 6.38 |
| | Muara Kuis | 29.17 | 68.75 | 2.08 | 35.71 | 44.64 | 19.64 |
| **Musi Banyuasin** | Macang Sakti | 20.5 | 74.4 | 5.1 | 26.5 | 69.4 | 4.1 |
| | Sako Suban | 37.0 | 55.6 | 7.4 | 38.1 | 50.0 | 11.9 |
| | Pangkalan Bulian | 47.4 | 45.6 | 7.0 | 33.3 | 61.5 | 5.1 |
| | Bukit Sejahtera | 36.6 | 61.0 | 2.4 | 32.5 | 65.0 | 2.5 |
| | Pagar Desa | 37.5 | 57.5 | 5.0 | 37.8 | 56.8 | 5.4 |
| | Mangsang | 34.0 | 63.8 | 2.1 | 27.5 | 70.0 | 2.5 |
| | Muara Medak | 41.2 | 58.8 | 0.0 | 44.9 | 55.1 | 0.0 |
| | Kepayang | 35.1 | 63.2 | 1.8 | 33.3 | 64.1 | 2.6 |
| **Banyuasin** | Sungsang IV | 46.5 | 46.5 | 7.0 | 37.5 | 52.5 | 10.0 |
| | Muara Sungsang | 30.9 | 61.8 | 7.3 | 40.9 | 54.6 | 4.6 |
| | Karang Anyar | 43.1 | 44.8 | 12.1 | 34.9 | 55.8 | 9.3 |
| | Purwodadi | 34.8 | 65.2 | 0.0 | 41.7 | 58.3 | 0.0 |
| | Majuria | 40.8 | 40.8 | 18.4 | 32.6 | 51.2 | 16.3 |
| | Timbul Jaya | 46.3 | 43.9 | 9.8 | 35.0 | 62.5 | 2.5 |
| **Average** | | **34.98** | **57.82** | **7.19** | **34.55** | **58.57** | **6.86** |

*SOURCE: Household Survey*

## 3. Ethnicity & Language

35. Sumatra Selatan has a diverse mix of ethnic groups, comprising of: Malay (31%), Javanese (27%); Komering (6%); Musi Banyuasin (3%); and Sundanese (2%) as illustrated below in Figure 3.

*Figure 3 Ethnic Languages in Study Area*




*SOURCE: Ethnic Groups in Indonesia (Based On "Peta Uuku Bang Sa Di Indonesia" National Museum of Indonesia)*

36. Whilst the main ethnic groups in Province are Malay and Javanese, it is more informative to understand the ethnic composition at the village level. The majority of villages are indigenous sub-groups including Palembang, Musi Hulu, Kubu, Komering, Rejan and Jambi, collectively composing more than 60% of total persons surveyed (the remaining villages are of mixed origins).

37. Marga Puspita and Kelumpang Jaya in Musi Rawas, Bukit Sejahtera in Musi Banyuasin and Muara Sungsang, Purwodadi and Majuria villages in Banyuasin are predominantly made up of immigrants from Java and other areas in Indonesia.

38. Table 6 summarizes the statistics for ethnicity and languages spoken for the villages surveyed. There are 6 living languages and dialects are spoken in Sumatra Selatan. Musi, also known as Palembang and Sekayu, is the main language spoken by the residents of the Palembang and the surrounding area. Musi is highly influenced by Javanese, because the first speakers came from Demak, Central Java in 18th century.

*Table 6 Village Ethnicity and Language Statistics*

| Regency | Name of Villages | Indigenous | Other | Musi Language | Java | Bahasa |
|---|---|---|---|---|---|---|
| Musi Rawas | Karang Panggung | 100.0 | 0.0 | 100.0 | 0.0 | 95.0 |
| | Marga Puspita | 0.0 | 100.0 | 0.0 | 100.0 | 100.0 |
| | Napal Licin | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | Kelumpang Jaya | 30.0 | 70.0 | 75.0 | 25.0 | 100.0 |
| | Tanjung Agung | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | Muara Kuis | 95.0 | 5.0 | 100.0 | 0.0 | 100.0 |
| Musi Banyuasin | Macang Sakti | 95.0 | 5.0 | 100.0 | 0.0 | 95.0 |
| | Sako Suban | 100.0 | 0.0 | 100.0 | 0.0 | 90.0 |
| | Pangkalan Bulian | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | Bukit Sejahtera | 15.0 | 85.0 | 100.0 | 0.0 | 100.0 |
| | Pagar Desa | 90.0 | 10.0 | 100.0 | 0.0 | 80.0 |
| | Mangsang | 55.0 | 45.0 | 90.0 | 10.0 | 100.0 |
| | Muara Medak | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | Kepayang | 85.0 | 15.0 | 100.0 | 0.0 | 90.0 |
| Banyuasin | Sungsang IV | 85.0 | 15.0 | 100.0 | 0.0 | 75.0 |
| | Muara Sungsang | 0.0 | 100.0 | 90.0 | 10.0 | 100.0 |
| | Karang Anyar | 100.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | Purwodadi | 0.0 | 100.0 | 100.0 | 0.0 | 100.0 |
| | Majuria | 0.0 | 100.0 | 100.0 | 0.0 | 100.0 |
| | Timbul Jaya | 10.0 | 90.0 | 100.0 | 0.0 | 100.0 |

*SOURCE: Household Survey*

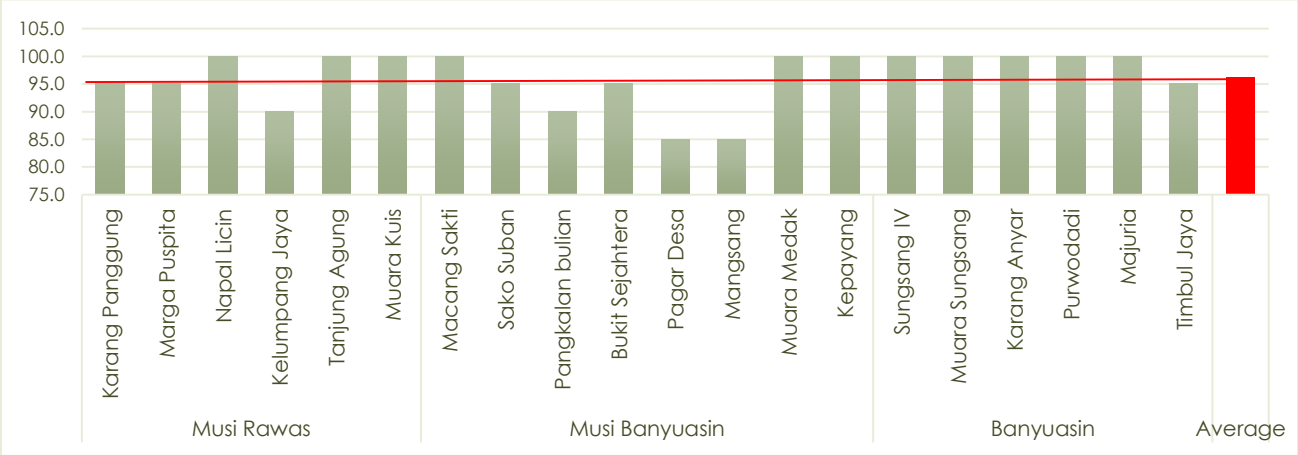
39. Whilst the Musi language has become a lingua franca in Sumatra Selatan, Bahasa is widely spoken across all of the villages surveyed. The study found that the majority of households spoke Musi (93%), and that 96% of households had members who could not speak Bahasa Indonesia. These findings would indicate that language and ethnicity should not influences the ability of a households or community to participate in and benefit from the broader socio-economic development in the region.

## 4. Gender

40. For the majority of villages within the survey area, more than 51% of the population are male. In terms of household leadership, 96% of households were headed up by males. However with regard

to decision making only 57% of males in the household actually made the decisions, with 39 % of households sharing the responsibility of decision making between husband and wife.

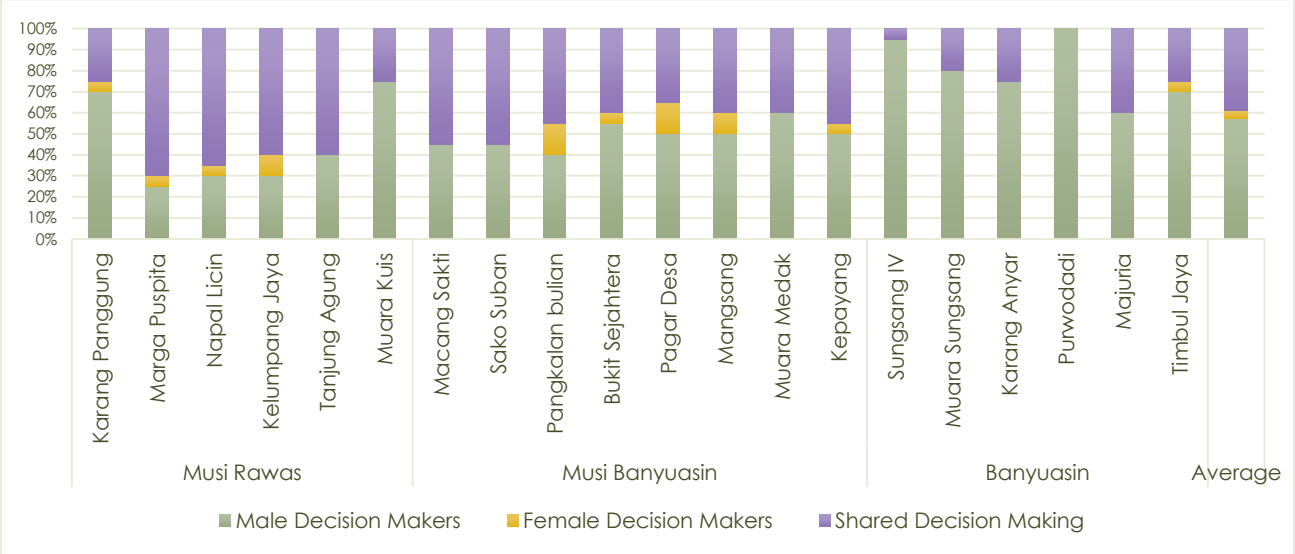
*Figure 4 Male Head of Household*




*SOURCE: Household Survey*

41. However, whilst our research showed that there were clear gender related differences in gender and decision making, there was no observable differences between different ethnicities in terms of household leadership or decision making.

*Figure 5 Household Decision Making*




*SOURCE: Household Survey*

# B. Poverty

## 1. Regional Context

42. A large number of households in Sumatra Selatan are considered to be vulnerable to poverty, especially in rural areas where 13.3% of urban and 14.5% of rural households are considered to be poor. This is significantly lower than the national average of 16.6% poor households in 2013, and is among the lowest in Sumatra.

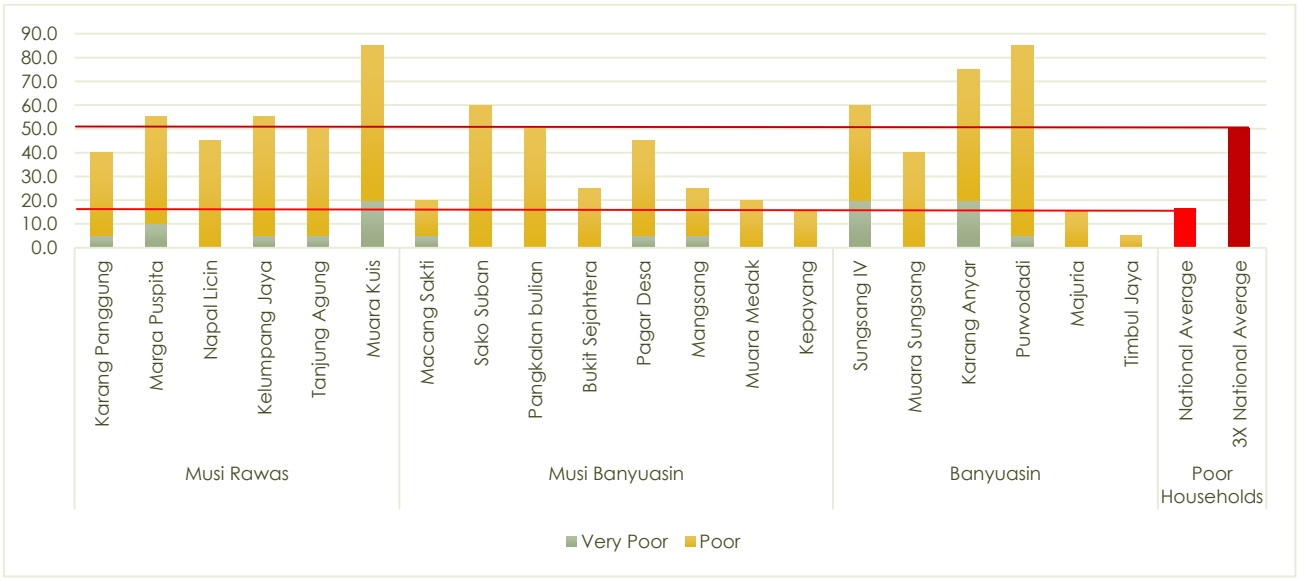
*Table 7 Number and Percentage of Poor People, Poverty Line (2013)*

| Province | Number of Poor People | | | Percentage of Poor | | | Poverty Line (Rp/Capita/Month) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Urban | Rural | Total | Urban | Rural | Ave | Urban | Rural | Ave |
| **Sumatera Selatan** | 375,960 | 732,250 | 1,108,210 | 13.28% | 14.50% | 14.06% | 328,335 | 270,166 | 291,058 |

*SOURCE: Sumatera Selatan Statistics Report 2010*

43. Whilst Sumatra Selatan has made considerable progress towards reducing poverty, the incidence of poverty in the remote interior of central Sumatra Selatan remains high. Only a small number of villages in the study area, including Timbul Jaya, Majuria and Kepayang had percentages of poor households equal to or lower than that for Indonesia or Sumatra Selatan. More than half the villages surveyed had more than double the national average of poor households and eight villages had nearly 3 times the national average as illustrated in Figure 6.

*Figure 6 Status of Poor Households by Village in the Study Area*



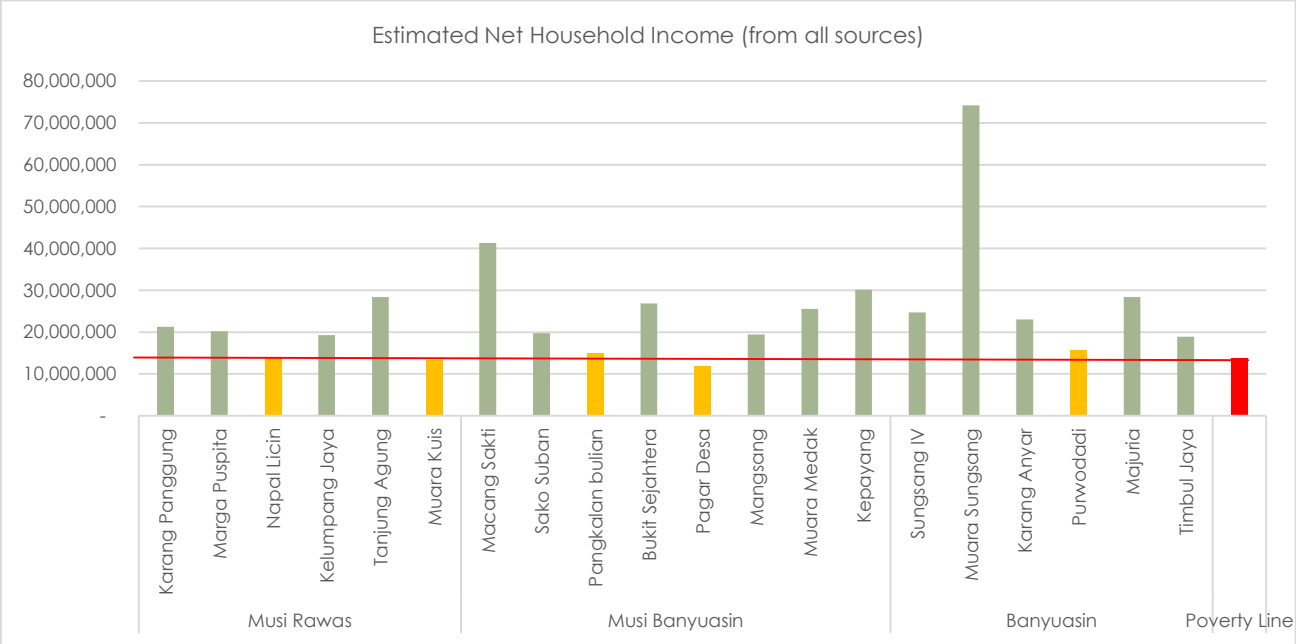

*SOURCE: Household Survey*

## 2. Poverty Indicators

44. In Indonesia, poverty is officially measured by a combination of monetary and non-monetary measures including: food security; household area(< 8 $m^2$ per person); dwelling standard (construction and condition); household ownership (< 0.5 hectares household); household assets; household utilities (water, toilet & electricity); and access to education and health services. If a family meets a minimum of 9 indicators from the above 14 indicators they are considered to be a 'poor household'.

45. Our survey found that in terms of household income from all sources, all of the villages surveyed had average annual incomes equal to or greater than the poverty line for Sumatra Selatan (i.e. Rp 9,253,192) as illustrated in Figure 7.

*Figure 7 Household Income levels (from all sources)*




*SOURCE: Household Survey*

46. The national indicator of poverty for rural area for Indonesia is Rp. 192,354 per person per month (BPS, 2010), and the regional indicator for rural Sumatra Selatan is Rp. 270166 per person per month, which equate to an annual poverty level of Rp 13,713,500,192 for rural households in Sumatra Selatan (for an average family size of 4.23 persons per family). Using monetary indicators alone would suggest that the incidence of poor households in the study area was low, with the villages of Pagar

Desa, Muara Kuis, Napal Licin, Purwodadi and Pangkalan Bulian being categorized as poor or near poor.

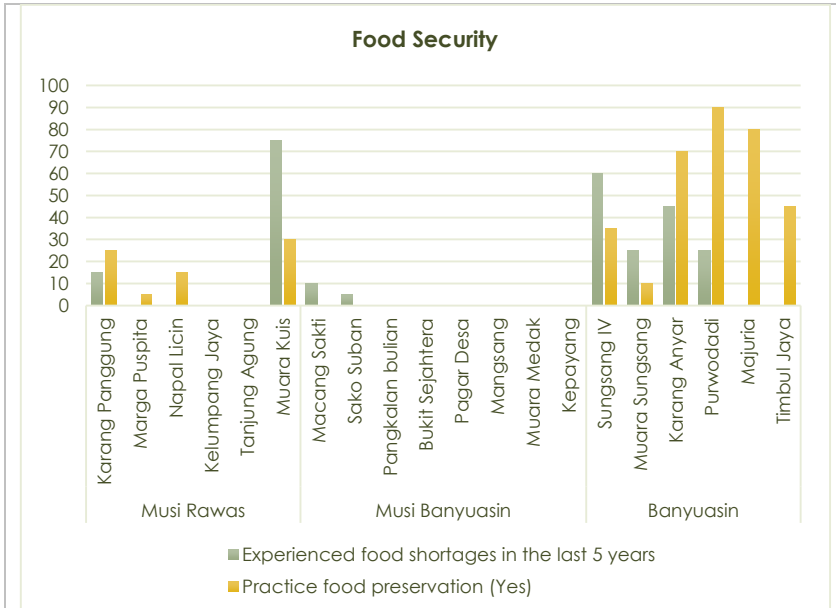
47. However, in terms of the number of near-poor in the study area that are highly vulnerable to falling into poverty, the number is considerably higher, and this would suggest that non-monetary poverty is arguably a more serious problem than income poverty in the study area. When one acknowledges all dimensions of human well-being - adequate consumption, reduced vulnerability, education, health and access to basic infrastructure - then almost half of all respondents would be considered to have experienced at least one dimension of poverty.

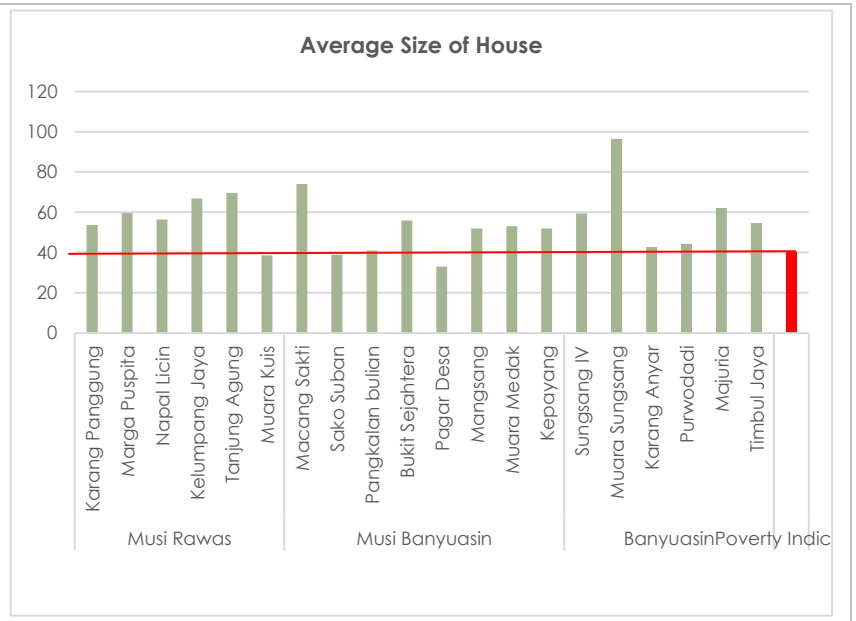
48. In this study we have used a number of these non-monetary indicators to evaluate the vulnerability of each village surveyed in the study area. Some of the key findings included:

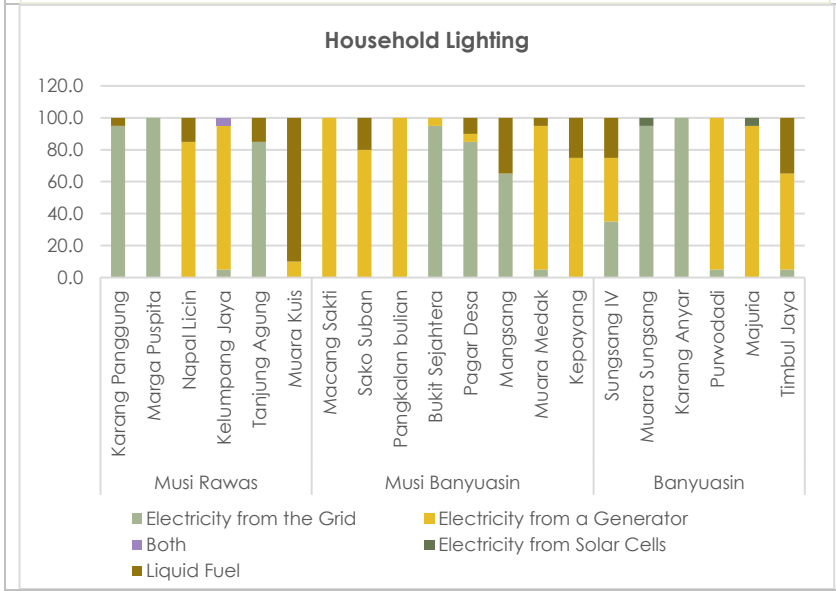
- **Food security**: - 1.3 out of 10 households surveyed experienced food shortages in the last 5 years, primarily in the villages of Muara Kuis (75%), Karang Panggung (15%) in Musi Rawas; Macang Sakti (10%) and Sako Suban (5%) in Musi Banyuasin; and Sungsang IV (60%), Muara Sungsang (25%), Karang Anyar (45%) and Purwodadi (25%) in Banyuasin.
- **Household size (<40m$^2$)**: - 2.5 out of 10 households have houses that are less than 40m$^2$, with Pagar Desa and Muara Kuis where 8 out of 10 households are below this threshold.
- **Access to electricity**: 3.8 out of 10 households have no access to electricity from the national grid, and a further 1.4 out of 10 households do not have any access to electricity in the study area compared to the national average of 2.1 out of 10 poor households across Indonesia.
- **Education and literacy**: - 2.5 out of 10 people from poor households have received less than primary school education, while illiteracy is close to the average for the poor, at 2.6 out of 10.

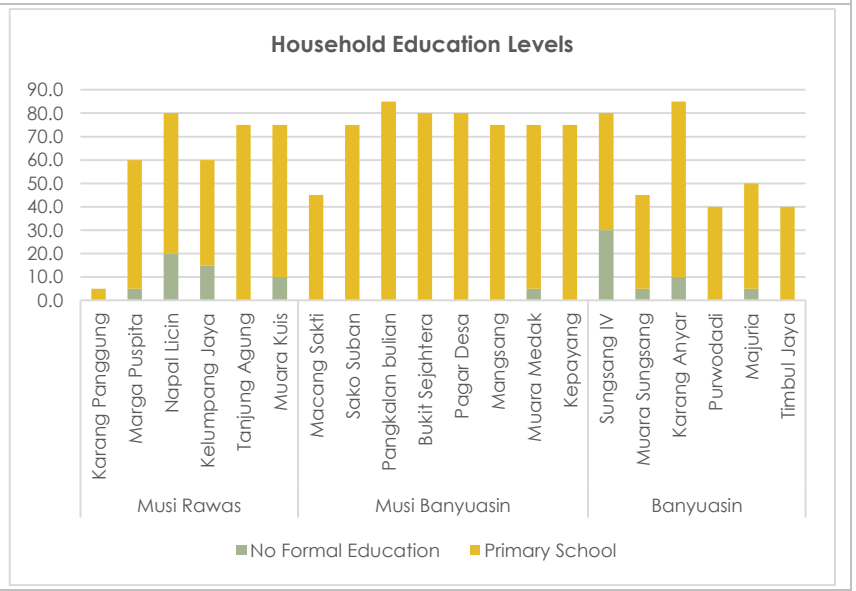
49. Combining information on these indicators with different poverty measures at a the village level allows us not only to understand the spatial patterns of poverty but allows us to analyze the vulnerability of the poor and near poor communities and households to climate change impacts and hazards into the future. Clearly, the impact of climate change on household income generation in 'poor' villages such as Pagar Desa, Muara Kuis and Napal Licin will be higher than those more wealthy villages such Macang Sakti and Muara Sungsang that are significantly more wealthy, and hence are more socio-economically vulnerable to climate change.

50. Further to this, when one considers the difficulties experienced by geographically isolated communities in gaining access to markets, almost three times as many poor households in Sumatra Selatan live in villages without an all-weather road as compared with average poor households in Indonesia, highlighting the difficulties of transportation in the more remote areas of the region.




*SOURCE: Household Survey*

# C. Livelihood Systems

## 1. Regional Overview

51. Vulnerable livelihood systems are those that:

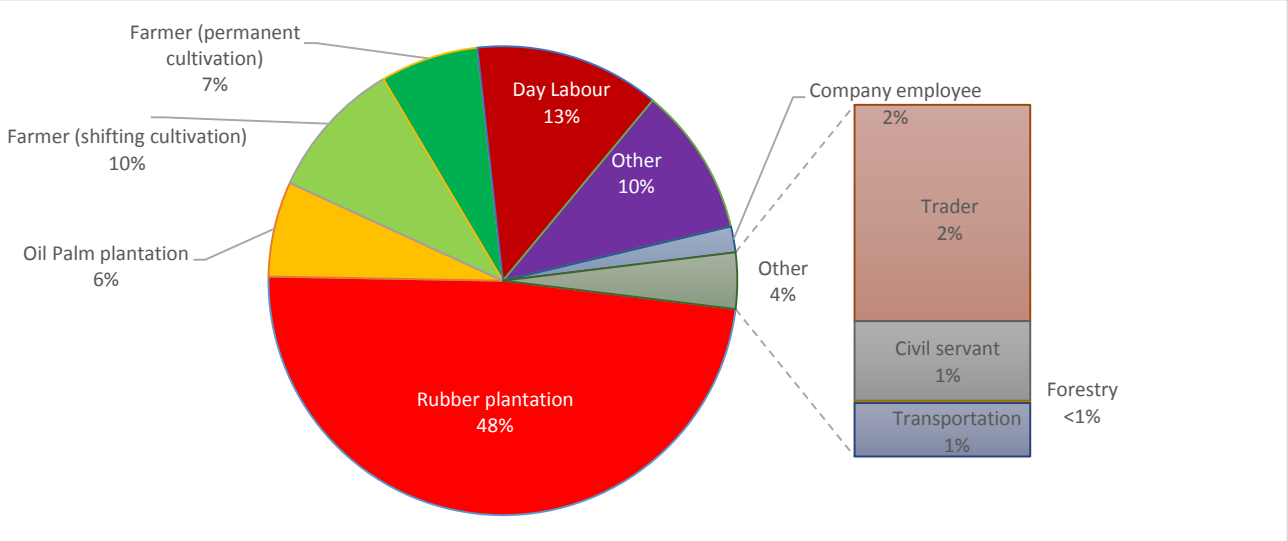
- Are highly dependent on resources and services that are vulnerable to climate impacts for their food security, income, physical protection, or other socio-economic aspects.
- Exhibit a high level of household engagement in strategies and activities that support subsistence occupations and generate few income streams.
- Have few viable livelihood alternatives or options, which is usually shaped by the availability of resources, together with local customs, land tenure systems and economic opportunities (availability of demand, and access to market etc.).

52. Our research identified two distinct livelihood system in the study area, these being: the Smallholder Plantation, Agriculture and Agroforestry System; and the Integrated Coastal Agriculture and Fishing System. These systems are discussed in detail below.

## 2. The Smallholder Plantation, Agriculture and Agroforestry System

53. The Smallholder Plantation, Agriculture and Agroforestry System, which is found in both Musi Rawas and Musi Banyuasin is predominantly based on smallholder production of rubber and/or oil palm, with some other associated crops such as coffee and pepper combined with rice-based permanent and/or shifting cultivation with supplementary agroforestry (as illustrated in Figure 8).

*Figure 8 Smallholder Plantation, Agriculture and Agroforestry System*




*SOURCE: Household Survey*

54. While tree crops are the dominant production system, small farms without tree crops are scattered throughout the system, producing food (rice and maize), cash crops (soybeans) and livestock. Secondary food crops consist of maize, cassava, sweet potatoes, peanuts, soybean, and mung bean. Smallholders also grow fruits and cash crops, raise large livestock, and supplement their livelihoods with off-farm income.

*Figure 9 Images of the Villages practicing the Smallholder Plantation, Agriculture and Agroforestry System*

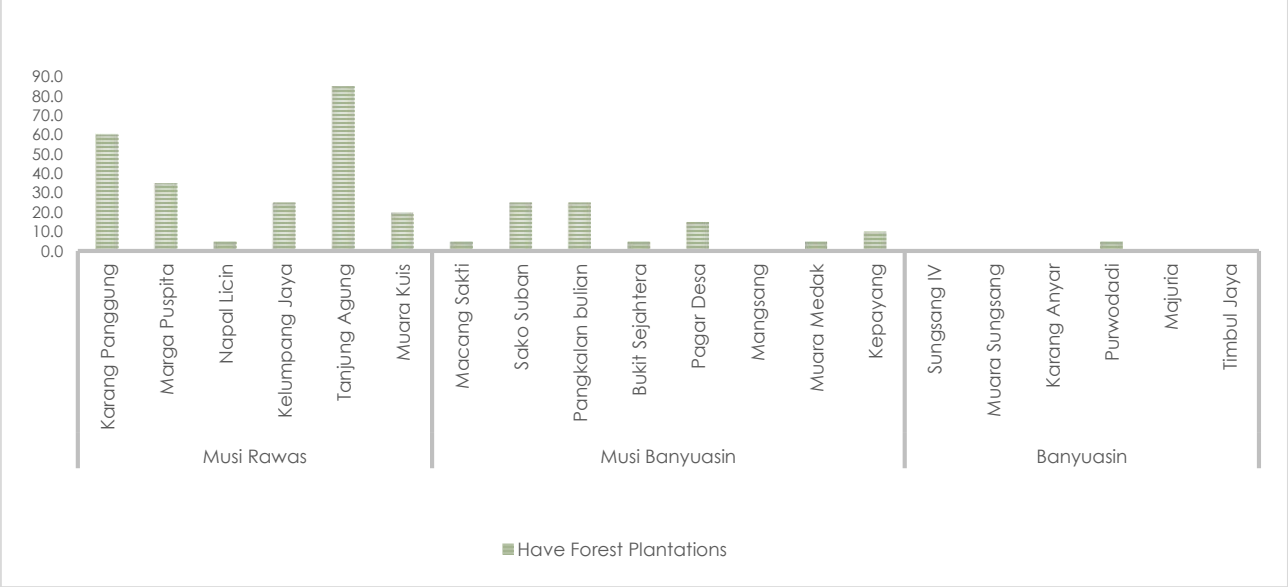
*SOURCE: Peter Mackay*

55. Private companies and government have established large factories, with high investment requirements, to process crops such as rubber, oil palm, tea and coffee in the study area, especially in Musi Banyuasin and Banyuasin. Smallholders supply raw materials or partly processed products to these factories. Unfortunately smallholder co-operatives or 'Kelompok' are not well developed and hence individual farmers often have no alternative but to accept whatever prices are offered by middlemen or factories for their raw products.

56. In terms of the development of alternative under forest agriculture, some intercropping is undertaken to increase and diversify incomes, both in the early years of establishment of new plantations and in mature plantations, and tree crop production systems (rubber and coconut plantations) has been combined with livestock production at a small (but lucrative) scale. In more recent times there has been a move to develop alternative products in order to diversify and add to incomes from some plantation crops, for example wooden products from rubber and coconut trees available when old stands are cut and replanted.

57. This system is based on the traditional slash and burn shifting agricultural system, and is dominated by indigenous and immigrant communities living primarily in Musi Rawas and to a lesser extent in Musi Banyuasin (as illustrated in Figure 9) who have access to adjacent commercial plantations and oil palm concessions, high off-farm income earning opportunities, and the potential to produce high value cash crops, fruits and vegetables.

*Figure 10 Households with Plantation Tree Crops*




*SOURCE: Household Survey*

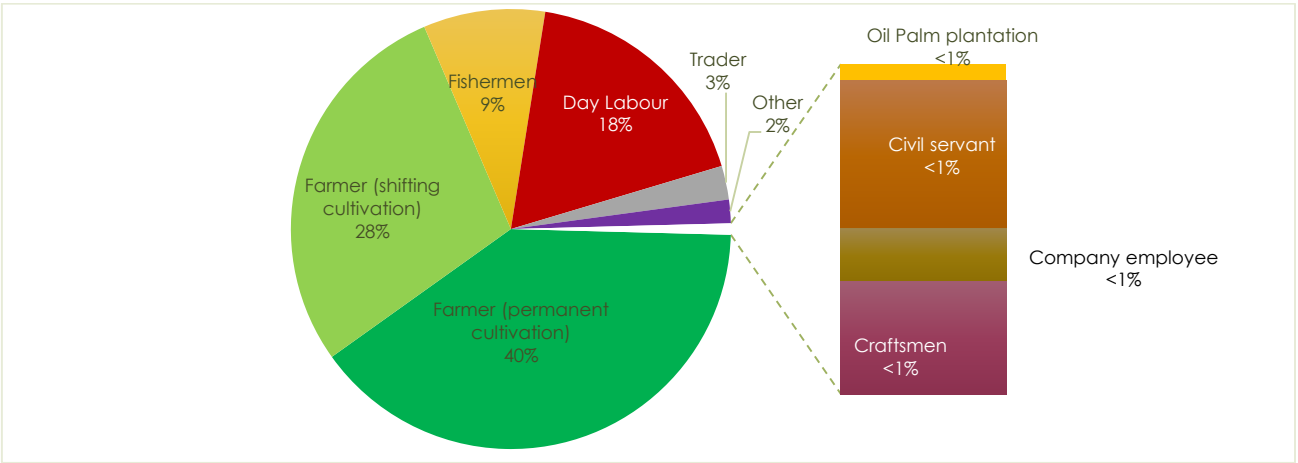
58. All these crops require intensive labor inputs for harvesting and processing and therefore profitability is determined by local labor costs. In some areas, such as Musi Banyuasin, rising labor costs are now seriously affecting the profitability of rubber plantations and there has been an observable shift to oil palm cultivation.

59. A typical smallholder rubber producer has 0.75 ha of land under rubber, either assigned by the commercial estate or on their own forest lands. The rubber is the principal source of household income. In addition, the household grows food crops, including upland rice and maize on a further 1 ha. No fertilizer is used on the food crops, so yields are low and the family purchases additional rice. The family has a home garden with a variety of fruit trees, herbs, spices and vegetables, which supplements household food supplies and improves the nutritional quality of the diet, as well as providing a surplus of fruit for cash sale. The household may keep between 12 cattle, a few goats and a dozen free range chickens. The sale of animals also generates small amounts of additional cash income. Vulnerability is relatively low to medium from the point of view of climate (except for fire), but the system is probably under greater pressure from declining world commodity prices.

## 3. The Integrated Coastal Agriculture and Fishing System

60. The Integrated Coastal Agriculture and Fishing System, which is predominantly found along the narrow coastal strip in Banyuasin is based primarily on small-scale artisanal fishing combined with the production of rice and coconut plantations, supplemented by cash-oriented trading, processing of seafood and off-farm labor.

*Figure 11 Integrated Coastal Agriculture and Fishing System*




*SOURCE: Household Survey*

61. This system is a diversified market-based system, dominated by immigrant communities with access to commercial markets, and high off-farm activities, low forest product cash income as illustrated in Figure 10.

*Figure 12 Images of Coastal Villages practicing the Integrated Coastal Agriculture and Fishing System*

*SOURCE: Peter Mackay*

62 As its name implies, the farming system is predominantly rice-based, with from one to two harvests per annum depending on rainfall distribution, length of growing season and the availability of supplementary irrigation, such as a number of villages in Banyuasin. Secondary crops include

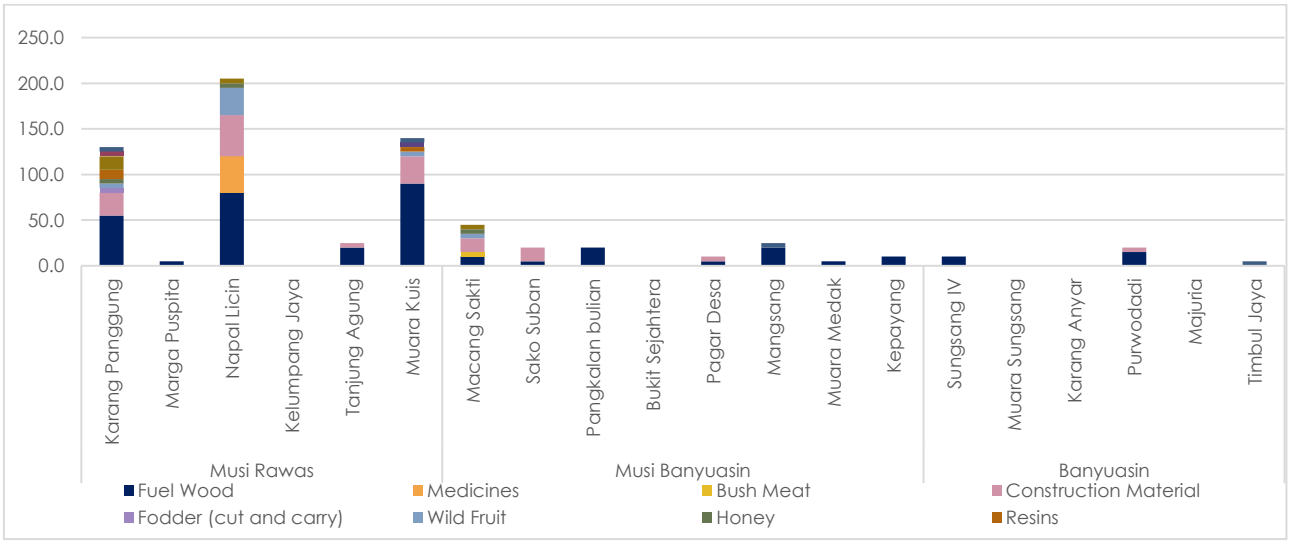
coconuts, vegetables, oilseeds, maize, root crops, soybeans, sugarcane, and fruits. Livestock are important for draught power, meat, income and savings purposes. Fishing and small livestock are a minor but important source of income and household nutrition. On-farm fish production may also be an important source of food in this farming system, either cultivated in association with wetland rice fields and or in small ponds under coconuts.

## 4. The Contribution of Forestry & Forest Products

63. Whilst both livelihood systems are primarily based on a combination of agriculture and forest production, they both incorporate a range of other livelihood strategies and activities that are dependencies on forest resources in the study area, and this is summarized in Figure 13, which highlights the relative importance of forest based activities in terms of their contribution to household livelihoods. Agriculture and forestry are the dominant land uses in terms of geographic extent and employment, and accounted for approximately 40% of the workforce in 2010 – in contrast to mining at 8%, manufacturing 4% and construction 9% (Sumatera Selatan Statistics Report 2010).

64. In this context forest products constitute a valuable source of fuel, timber, fodder and food for the many of villages in the study area, and especially for the more forest dependent villages in Musi Rawas and to a lesser extent Musi Banyuasin, as well as an important source of cash through the sale of non-timber forest products (NTFPs) and forest timber. Unfortunately the survey did not pick up the value of subsistence fishing activities in Banyuasin associated with collection of fish, prawns and shellfish from estuarine and coastal wetland systems and mangrove forest.

*Figure 13 Importance of Forests Products to Household Livelihoods*

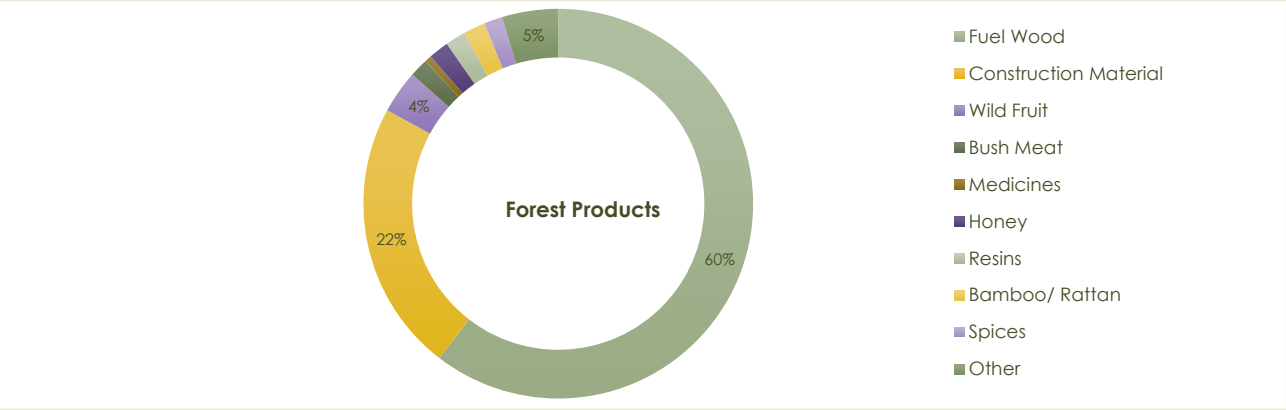



*SOURCE: Household Survey*

65. Figure 12 provides a summary of the different forest products used in the survey area. The most common uses for forests products are:

- Fuel wood (60%) and timber (22%) for house construction;
- Fruit and resins (9%);
- Bush meat, honey, and medicines for local consumption and use (9%).

*Figure 14 Forest Use in the Study Area*




*SOURCE: Household Survey*

## D. Biodiversity Conservation & Forest Use

### 1. Regional Context

66. In 2012, the total of forest area in Sumatera Selatan was 3,668,900 hectares. Forests in Indonesia are sub-divided into three groups based on their function, namely (a) production forest, (b) conservation forest, and (c) protection forest. Under Indonesian law a forest is described as an ecosystem which is dominated by trees whereby:

- The production forest is used for the production of timber and non-wood forest products;
- The protection forest is an area earmarked for watershed management, erosion control as well as the conservation of wildlife; and
- Conservation forests are areas which have been specifically set aside for the protection of ecosystems including their biological diversity.

67. Forest categories are also based on their current utilization as permanent forest and conversion forest. Permanent forest is further divided into protected forest, preserved forests, limited production forest, and permanent production forest.

68. Table 8 provides a summary of the area for each forest category for Musi Rawas, Musi Banyuasin and Banyuasin. From the total of forest area, about 19.3 % was located in Musi Banyuasin, 16.3% in Musi Rawas and 14.2% in Banyuasin.

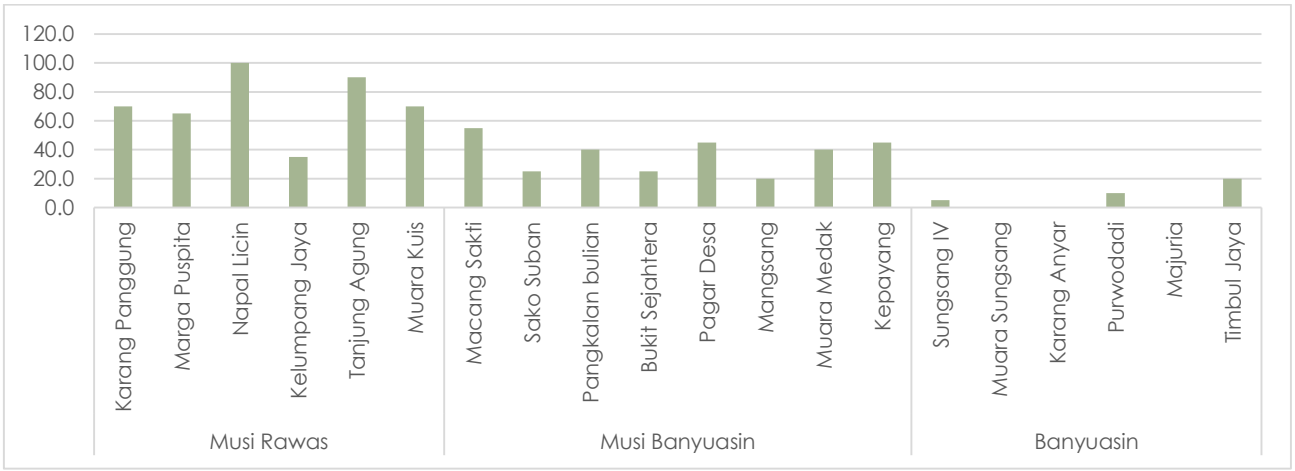
*Table 8 Forest Area and Function in Sumatera Selatan Province (ha), 2012*

| Province/District | Protection Forest | Conservation Area | Limited Production Forest | Permanent Production Forest | Convertible Production Forest | Total (Ha) |
|---|---|---|---|---|---|---|
| ***Sumatra Selatan*** | 591,830 | 792,906 | 236,891 | 1,687,545 | 359,728 | 3,668,900 |
| ***Musi Rawas*** | 1,087 | 242,915 | 43,315 | 278,296 | 34,470 | 600,083 |
| ***Musi Banyuasin*** | 19,589 | 69,353 | 95,010 | 412,014 | 113,097 | 709,063 |
| ***Banyuasin*** | 69,146 | 342,863 | 0 | 71,565 | 37,756 | 521,330 |

*SOURCE: Forestry Service of Sumatera Selatan Province*

69. The study area includes a number of important conservation areas and protected forests including: Sembilang National Park; Kerinci Seblat National Park; Bentayan Wildlife Reserve; Dangku Wildlife Reserve; Punti Kayu Nature Recreation Park; Terusan Dalam Game Reserve; and Padang Sugihan Wildlife Reserve. Whilst there are a total of 591,83,02 hectares of protected forest and 792,90,67 hectares of natural conservation forest in the study area, Banyuasin has the largest area for both categories of forest compared to other regencies, with 69,146 ha of Protection Forest and 342,863 ha of Conservation Forest.

*Figure 15 Attitudes towards the Benefits of Protected Forests*




*SOURCE: Household Survey*

70. We ascertained villagers' perceptions about the benefits of protection forest forests for their livelihoods. Our findings indicate that 38% of respondents clearly acknowledging the benefits of forest protection. However, it was also clear that the overall patterns indicated that the benefits from

forest use differed substantially across the study area with support for forest protection was highest in Musi Rawas and to a lesser extent Musi Banyuasin. Support from villages living immediately adjacent to Sembilang National Park in Banyuasin exhibited surprisingly low appreciation of the benefits from forest protection as illustrates in Figure ##.

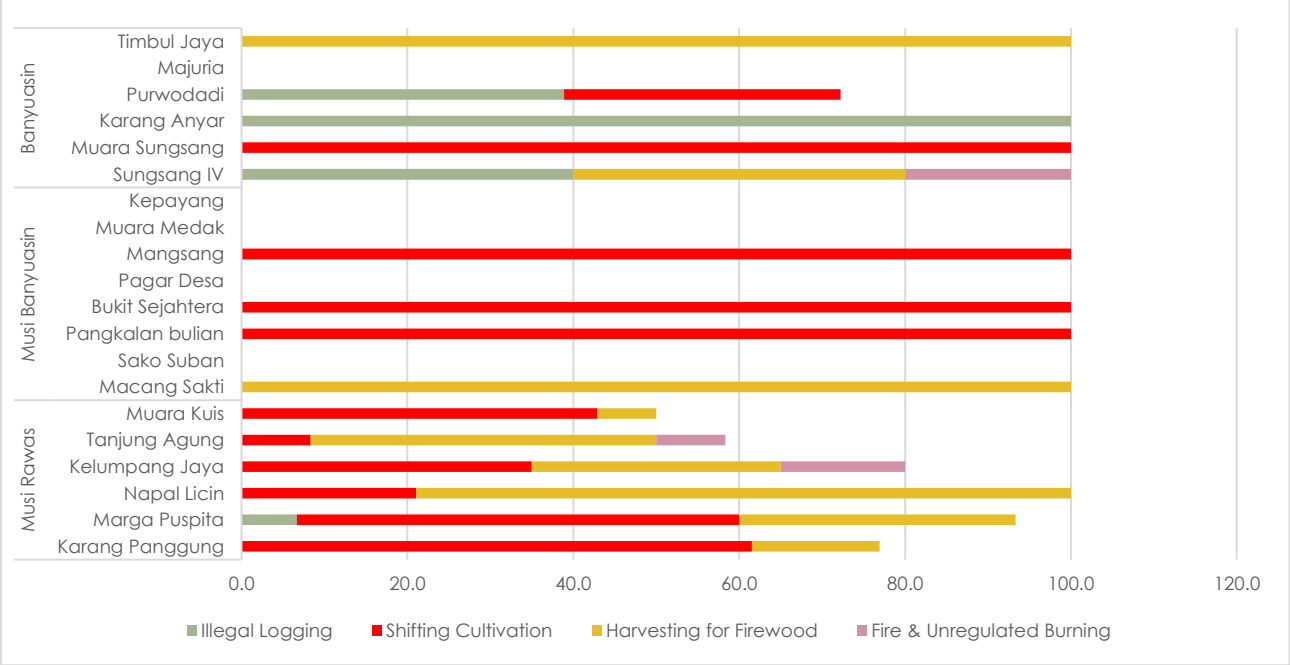
71. Support for forest protection was highest in Musi Rawas, and it is fair to say that these villages rely on forests and forest products for their livelihoods. In contrast, the villages in Banyuasin rely on rice, coconuts and fishing for their livelihoods, and most likely only benefit from the Fuelwood collection and the collection of shellfish from within the protected forest as previously discussed. People are more likely to appreciate protected forest if benefits gained from them offset the associated costs. It is clear that the villages in Musi Rawas and Musi Banyuasin benefit more directly from forests and forest protection than the villages living adjacent to Sembilang National Park – primarily because they can obtained benefits from forests and forestry through resource extraction, employment and other livelihood opportunities.

## 2. Forest Degradation

72. Forest degradation is widespread in Sumatera Selatan. Whilst most forest degradation has occurred in production forest areas, protection and conservation forests have also been adversely affected by illegal logging, shifting cultivation, fire and firewood collection, and many of these areas have subsequently been occupied legally and illegally, and converted to 'community' gardens, rubber plantations and more recently oil palm plantings.

73. Whilst the main sources of forest degradation in the past have been driven by illegal logging shifting cultivation and fire, today the primary drivers at the village level appear to be the conversion of forest plots to more permanent smallholder plantations, agroforestry and the production of high value cash crops such as coffee – and this is occurring in production forest and protection areas. This is partly due to the opportunities for income generation, commercial plantation developments development, and to inward migration of labor from other regions throughout Indonesia.

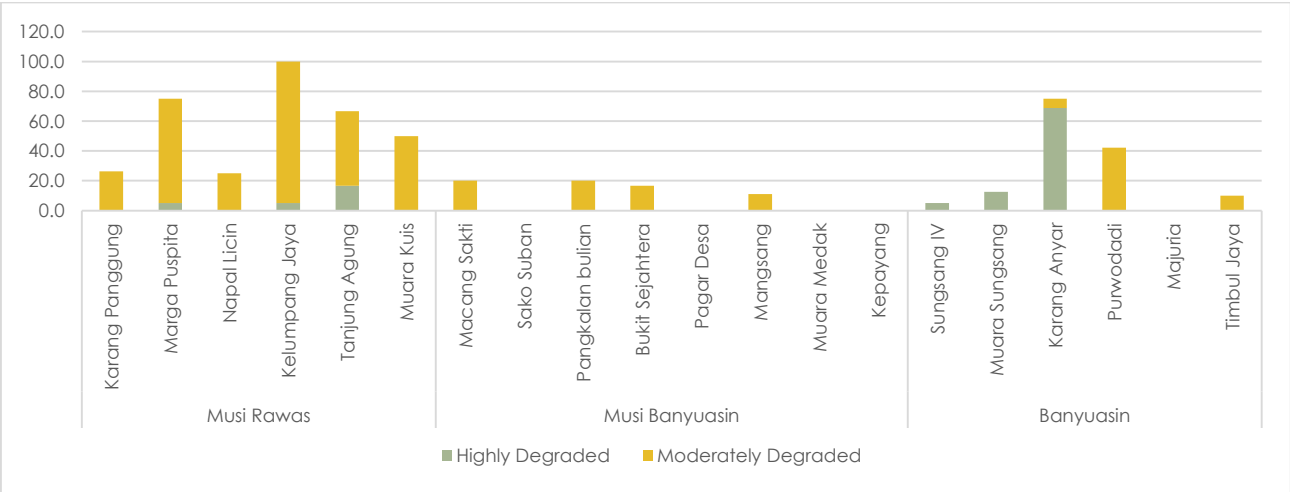
*Figure 16 Sources of Forest Degradation in the Study Area*




*SOURCE: Household Survey*

74. Local people who use these lands generally considered forest degradation on a small scale to be positive because it directly benefits people's welfare. However, relationships between large-scale deforestation (e.g., for commercial scale oil palm or acacia plantations) and benefits to livelihood are complex. Figure 17 highlights the perceived attitudes towards forest degradation in the study area.

*Figure 17 Attitudes towards Forest Degradation*




*SOURCE: Household Survey*

75. Whilst many of the respondents recognized the potential benefits that could accompany deforestation, such as off farm employment, they also appreciated that such developments could have overall negative impacts on them, and their families. The level of awareness regarding conservation issues and protected area management practices may also have contributed to the difference in attitudes. None of the villages in Musi Rawas or Musi Banyuasin are actively involved in forest restoration. However, Karang Panggung, Tanjung Agung, Muara Kuis and Napal Licin identified the need to restore degraded rubber plantations that had been damaged by strong winds, and Sungsang IV was previously involved as paid workers in rehabilitation of abandoned shrimp ponds in Sembilang National Park. Muara Sungsang also identified the need to develop flood control and drainage works in order to restore land for coconut plantations.

76. Whilst the interviews indicated high awareness of negative environmental impacts of deforestation in Musi Rawas, villages in Banyuasin and Musi Banyuasin had a lower level of awareness on forest degradation in their areas, and this may be associated with negative attitudes towards forest protection and conservation. The lack of involvement of the local community in the decision making processes and in forest management groups are also important determinants of negative attitudes toward protected forests and conservation, and this is discussed further in the following section.

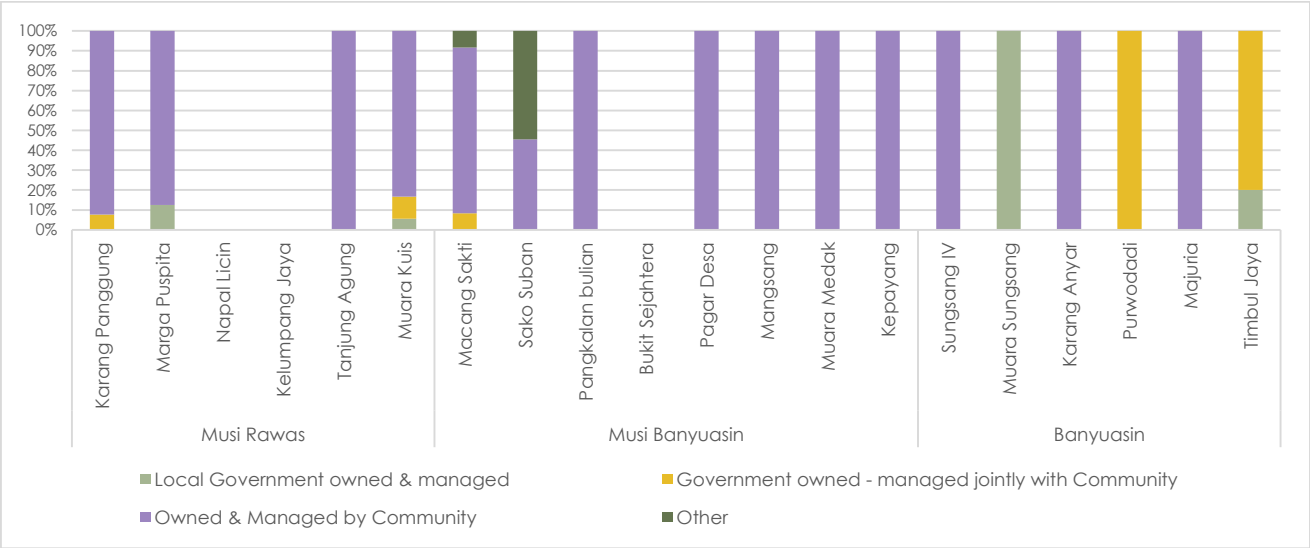
## 3. Community Forestry

77. Community forestry in the study area comes in a range of forms, ranging from the traditional (*adat*) forest territories of indigenous people through to community forestry managed under license, by non-indigenous groups. Seventeen of the 20 villages surveyed indicated that they were involved in community forestry, primarily on community owned and managed lands, with the exception being in for Purwodadi and Timbul Jaya villages where community managed Government owned forest jointly with Government, and Muara Sungsang where Local Government owned & managed community forest lands.

78. The two newest government supported forms are Community-Based Forests and Village Forests in the study area are where individual farmer groups or village-based institutions obtain 35-year licenses to either manage areas of production or protection forests (including the harvest forest products) – or to manage and protect state forestlands that have not been assigned to other entities. Both options are attractive options for future community forestry in the study area, and are consistent with current approaches.

79. However, many villages in the study area continue practice their own traditional forms of community-based forestry and have done so for a long time. Communities in Musi Rawas and Musi Banyuasin have been growing trees in slash and burn plots, enriching forests by planting new trees, selectively logging natural forest and managing smallholder rubber plantations as inholdings in native forests.

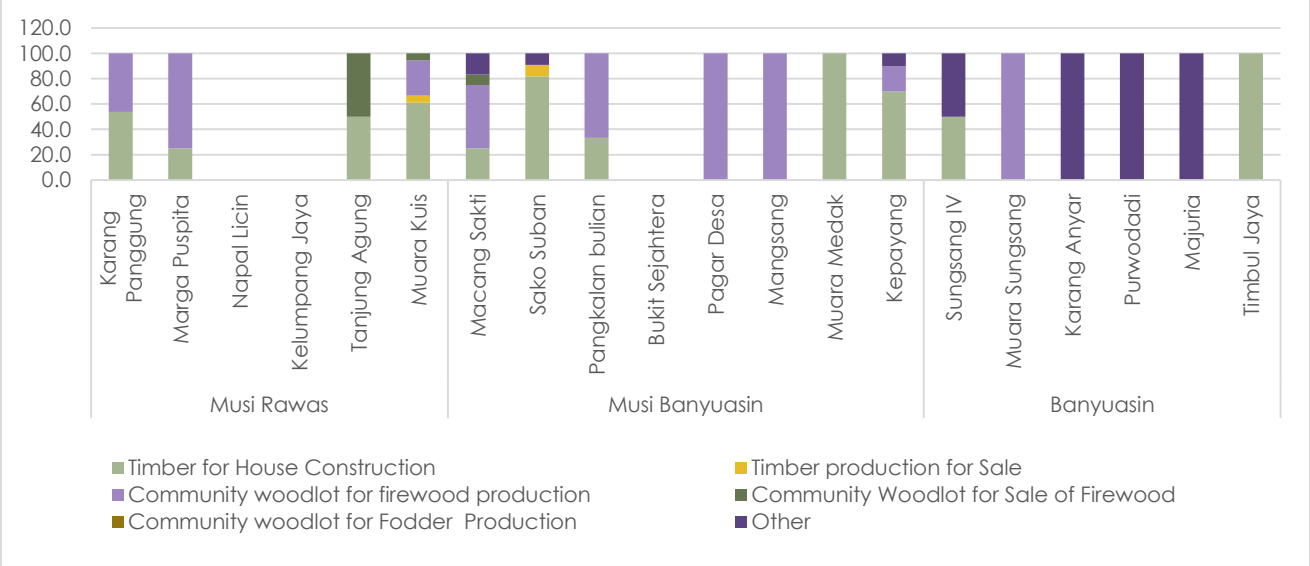
*Figure 18 Community Forest Management in the Study Area*




*SOURCE: Household Survey*

80. Whilst the Basic Forestry Law grants village's equal access to use and manage state-owned forests, it is important to understand how and where communities are practicing community forestry in the study area. Figure 19 clearly illustrates that the majority of villages practicing community forestry for the purposes of fuel wood collection for domestic consumption(60%), harvesting native timber for local house construction (22%), and the collection of forest products for subsistence purposes. Only 5 villages are producing timber and fuel wood for sale into the local markets.

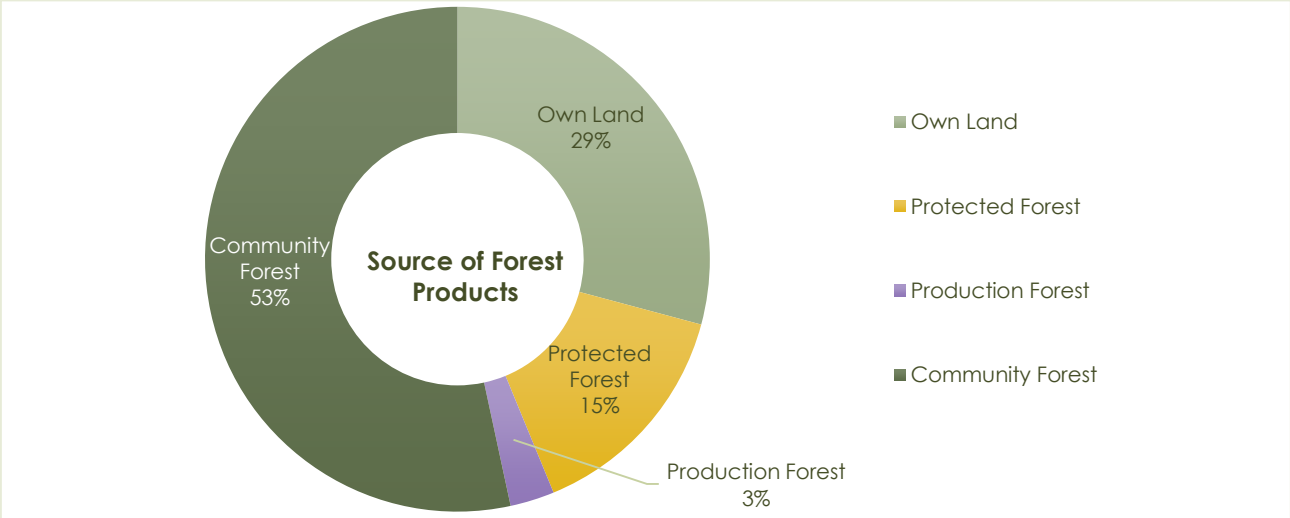
*Figure 19 Community Forestry in the Study Area*




*SOURCE: Household Survey*

81. It is also very important to understand where villages in the study area that are practicing community forestry are actually sourcing their forest products. Figure 20 provides a summary of where the community source their forest products.

*Figure 20 Sources of Forest Products*



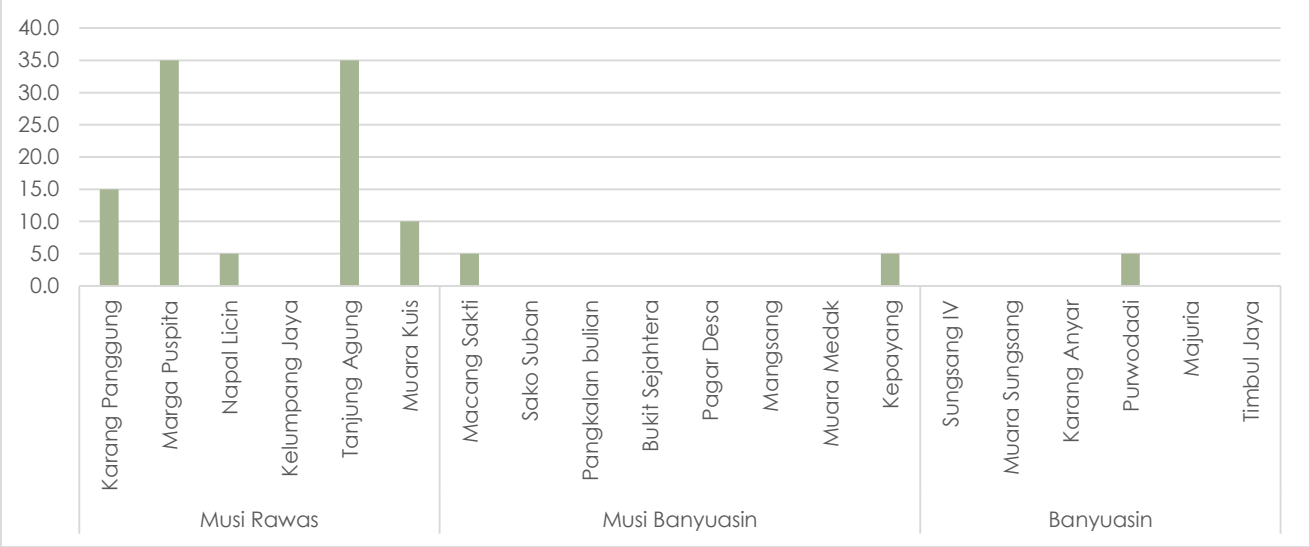

*SOURCE: Household Survey*

82. Whilst it is clear that the majority of households in the study area are sourcing forest products from either their own lands (29%, or from community forest (53%), 15% of households are sourcing products from protection forests, and it is highly likely that illegal harvesting and collection of forest products is occurring in forests have been set aside for biodiversity conservation such as Sembilang National Park where satellite imagery shows forest clearing and degradation associated with encroachment (for shrimp farming) and illegal harvesting of mangroves for fuel wood.

83. Community forestry has been promoted in Indonesia by a number of agencies, notably the Ford Foundation but also IGOs, aid agencies and NGOs. Whilst it is understood that community forestry can play an important role in economic development and enhanced livelihoods at the village level through the promotion of forest-based enterprises to enhance rural livelihoods and encourage a shift to sustainable forest management to reduce deforestation, it is also understood that this will be difficult to achieve where local communities face intense pressure from the rapid development of forest-based industries like oil palm and rubber, and the associated inward migration of economic migrants.

84. Nevertheless, a number of the villages surveyed indicated that they were interested in, or had plans to expand community based forestry in their areas, especially villages of Marga Puspita, Tanjung Agung and Karang Panggung in Musi Rawas. This is not surprising given the relative importance of forestry to household livelihoods in those villages, and their general reliance on forest products for income, as opposed to the villages in Banyuasin who derive their livelihoods from agriculture and fishing. Planned community forest initiatives include teak, rubber, durian in Tanjung Agung, Marga Puspita (Musi Rawas), and mixed trees (tembawang) in Pangkalan Bulian and Muara Medak, and tanaman hutan in Bukit Sejahtera.

*Figure 21 Plan to Expand Community Based Forestry*




*SOURCE: Household Survey*

# E. Climate Change

## 1. Regional Vulnerability

85. Sumatera Selatan is considered to be one of the vulnerable provinces to the effects of climate change in Indonesia. Over the last 30 years, observed climate change in the Indonesia has included: an increase in the mean annual temperature by about 0.3°C; a decrease in annual precipitation by 2 to 3%; and a significant change seasonality of precipitation (wet and dry seasons) whereby the wet season rainfall in the southern region of Indonesia has increased with a longer, dryer dry season (Hulme and Sheard, 1999; Boer and Faqih, 2004).

86. For Sumatera Selatan, local records indicate that there was an observable increase in temperature over the last 25 years around 0.31°C in Palembang City and 0.67oC for the whole of Sumatera Selatan generally. In terms of precipitation rate in Sumatera Selatan, the historical records were less clear, due to the high inter-annual variability caused by extreme precipitation events.

87. In terms of future climate change projections for Indonesia it is expected that there will be: a general warming of between 0.2 to 0.3°C per decade throughout Indonesia; an increase in annual precipitation across the majority of the Indonesian islands, except in southern Indonesia (including Sumatera Selatan) where is it projected to decline by up to 15 %; a change in the seasonality of precipitation (with parts of Sumatra becoming 10 to 30% wetter during December-February and 5 to

15% drier during June-August by 2080); and as much as a 30-day delay in the annual onset of the monsoon, 10% increase in rainfall later in the crop year (April-June), and up to 75% decrease in rainfall later in the dry season (July–September) (projected climate change (Hulme and Sheard, 1999; Boer and Faqih, 2004; Naylor et al., 2007).

88. In addition to this, based on projection for the periods of 2030 and 2080, the risk of extreme precipitation (i.e.) 100 mm/day) is expected to increase significantly compared to the year 2000. Similarly, estimation of future sea level rise based on altimeter satellite, model, and tide gauge will be around 0.5 0.7 cm annually. As a result, the projection of sea level rise in 2030 will be 13.5+6.15 cm above the sea level in 2000.

89. Extreme events will also influence the sea level rise, for instance, La-Nina phenomena in the Pacific Ocean may increase sea level around 15 cm compared to sea level at normal condition. In the future, La-Nina phenomena is predicted to be longer and will occur more often which cause in higher and faster speed of waves, and sea level rise. ENSO projection which incorporated El-Nino and La-Nina phenomena suggested that both of them will happen every year which interspersed by normal condition in year 2013/2014, 2021/2022, and 2027/2028.

90. There is evidence that the impacts of climate change are already being felt in Kalimantan, and future projections outlines above indicate that it is highly likely that the province will become increasingly vulnerable to the effects of climate change. In this identified that the most important effects of climate change on forest dependent communities in Sumatera Selatan will be:

- The combination of higher temperatures and increased rainfall is likely to cause a net increase in the evapotranspiration in the winter months and as such may have a significant impact on the natural forest ecosystems of Sumatera Selatan, including the disappearance or reduction of density of certain species due shifts in ideal temperature and rainfall range, increasing forest disease and pest infestation, the increase or the decrease of forest productivity;
- With increased rainfall in the monsoon, it is expected that we will also see enhanced runoff that could lead to enhanced top soil erosion and overall habitat degradation of forest ecosystems, especially in upland forest areas used for slash and burn agriculture. Changes in rainfall patterns will also most certainly have a negative effect on slash and burn agricultural productivity and food production in forest and coastal areas.
- Increased runoff could also cause recurring floods in many areas (especially in those areas already prone to flooding) and longer residence time for flood water which will

have an impact on paddy rice production and the survival of plantation crops in the lower lying forest and coastal areas.

- The increased risk of forest fire due to decreasing dry season rainfall and shortening of the length of the wet season in some part of the region associated with the El Niño phenomena. Sumatera Selatan is already exposed to high risk of fire, and CIFOR recently found that future risk of fi res in parts of Sumatera Selatan would be greater than in the past due to an increase in average drought indices and the number of days with 'extreme' danger rating.
- Long dry seasons during El Niño years significantly affect not only annual crops, but also perennial forest crops due to the impact of a longer dry season on propagation, fruiting and survival of young plants. Based on observations in a number of locations, the average young plant dieback for tea crops was approximately 22%, between 4% and 9% for rubber, about 4% for cacao, between 1.5% and 11% for cashew nuts, about 4% for coffee and between 5% and 30%for coconut. For mature plantation crops such as coconut and palm oil, the impact of severe drought appears after 4-9 months (Hasan et al., 1998).

91. With regard to the most immediate risk, Sumatera Selatan is highly exposed to the impacts of flooding and inundation from the combined effects of sea level rise, storm surge and extreme rainfall events. Table 9 shows the potential flood inundation hazard for a combination of intense rainfall, tidal, and sea level rise for 2080 for Banyuasin, Musi Rawas and Musi Banyuasin Regencies. These projection indicate that whilst all three Regencies in the study area will be adversely effected by increased flooding and inundation into the future, Banyuasin will be most vulnerable with up to 59.8% of the Regency potentially being at risk of flooding and inundation into the future.

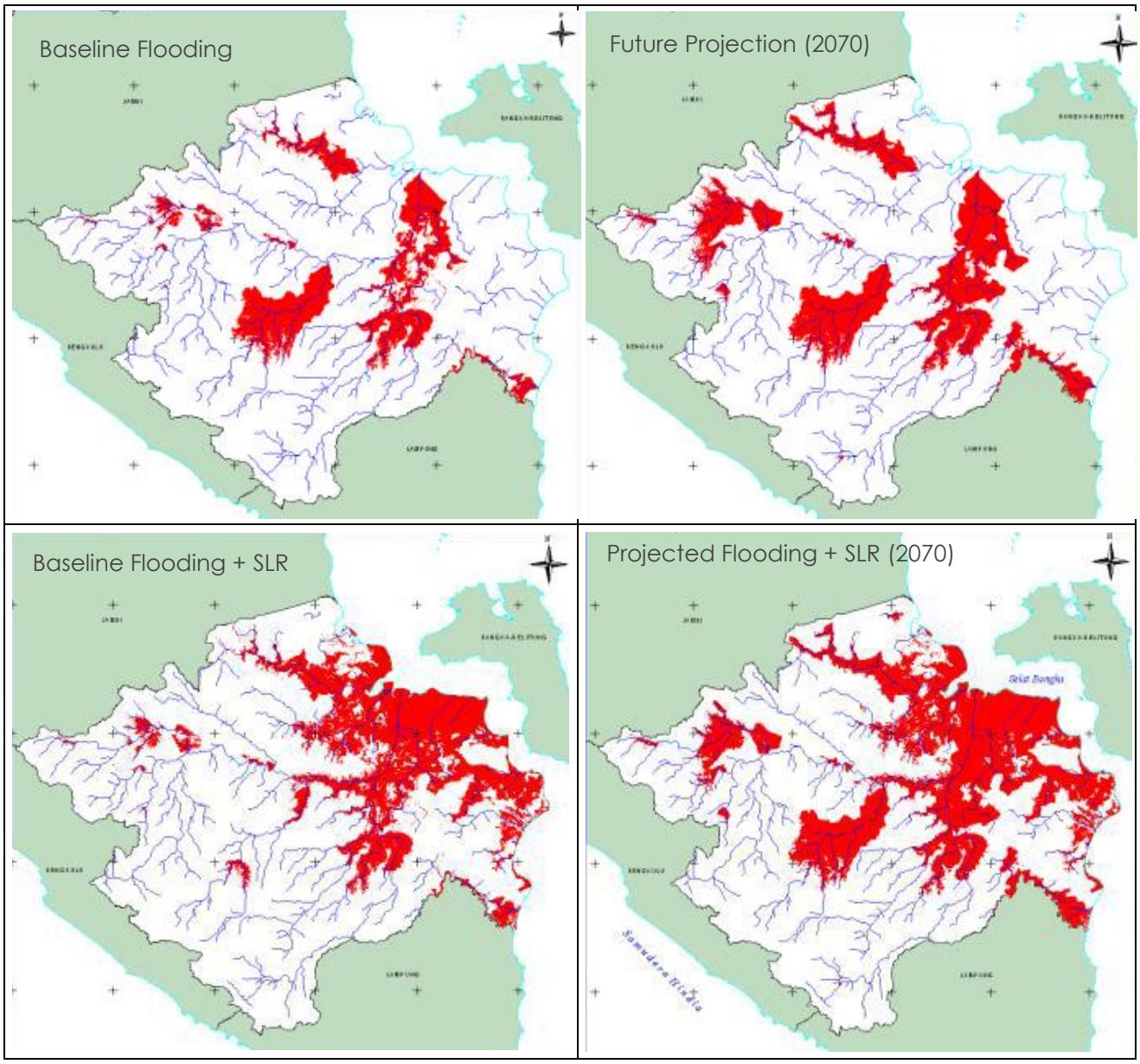
*Table 9 Flood area of South Sumatera Province*

| Regency | Area Flooded | | Area Inundated (Flood + SLR) | |
|---|---|---|---|---|
| | Baseline | Projection | Baseline | Projection |
| **Musi Rawas** | 4.8% | 17.3% | 4.8% | 17.3% |
| **Musi Banyuasin** | 9.6% | 14.2% | 12.2% | 15.3% |
| **Banyuasin** | 16.9% | 20.8% | 57.3% | 59.8% |

*SOURCE Djoko et al. (2013)*

92. Figure 22 illustrates the potential impacts on coastal and riverine communities in the study area. Whilst coastal flooding and inundation are probably the most easily discernable climate change hazards, the threat of drought and increase in forest fire (and their potential impacts on the livelihoods of local people), also pose serious threats.

*Figure 22 Inundation (Flood + SLR) map of South Sumatera province*




*SOURCE Djoko et al. (2013)*

## 2. Climate Change in the Study Area

93. Whilst reliable historic temperature data for the study area does not exist, it is clear from our survey that the majority of villages surveyed (i.e. 18 out of 20) have experiences significant changes in climate over the last 20 years, with the exceptions being Kelumpang Jaya and Marga Puspita villages.

*Figure 23 Observed Changes in Climate over the last 20 Years*


*SOURCE: Household Survey*

94. Our survey found that the majority of respondents observed moderate to significant changes in annual temperatures (76%) and annual rainfall (80%), and that most important climate change impacts related to the shift in the seasonality of precipitation (wet and dry seasons) and the increase in flooding associated with heavy rainfall, and prolonged periods of drought due to erratic/changing rainfall patterns. Table 10 provides a snapshot of the current perceptions of climate hazard risk at the household and village levels in the study area. Whilst it is clear that flooding (due to extreme rainfall) and the incidence of tropical storms are recognized as important risks across the study area, changes seasonality, a hotter climate and the increase in the incidence of drought are of greater concern to the majority of communities.

*Table 10 Community Perceptions of Climate Hazard Risks*

| | Name of Villages | Tropical Storms | Coastal Inundation/ Storm Surge | Coastal Erosion | Flooding (extreme rainfall) | Saline Intrusion | Landslides / Mudslides | Soil Erosion | Changes in length of seasons | Changes in onset of the seasons | Hotter climate | Drought | More Bushfires | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Musi Rawas** | Karang Panggung | Very Low | Low | Very Low | High | Very Low | Medium | Very Low | Medium | Medium | Very Low | Very Low | Very Low | Very Low |
| | Marga Puspita | Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Medium | Medium | Medium | Low | Very Low | Very Low |
| | Napal Licin | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low |
| | Kelumpang Jaya | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low |
| | Tanjung Agung | Very Low | Very Low | Very Low | Very Low | Medium | Very Low | Very Low | Medium | Low | Medium | Medium | Medium | Very Low |
| | Muara Kuis | High | Medium | Very Low | Very Low | Very Low | Medium | Very Low | Medium | Medium | High | High | High | Low |
| **Musi Banyuasin** | Macang Sakti | Very Low | Very Low | Very Low | High | Very Low | Very Low | Very Low | High | High | High | High | Low | Very Low |
| | Sako Suban | Medium | Medium | Very Low | Medium | Very Low | Very Low | Very Low | Medium | Medium | High | Low | Low | Very Low |
| | Pangkalan Bulian | Low | Medium | Very Low | High | Very Low | Very Low | Very Low | Medium | Low | Medium | Very Low | Low | Very Low |
| | Bukit Sejahtera | Very Low | Very Low | Very Low | Low | Very Low | Very Low | Very Low | Medium | Low | High | High | Very Low | Very Low |
| | Pagar Desa | Low | Low | Very Low | Low | Very Low | Very Low | Very Low | Medium | Low | High | Low | Medium | Very Low |
| | Mangsang | Very Low | Very Low | Very Low | Low | Very Low | Very Low | Very Low | Medium | Very Low | Low | Low | Low | Very Low |
| | Muara Medak | Very Low | Very Low | Very Low | Low | Very Low | Very Low | Very Low | Low | Medium | High | Low | Low | Very Low |
| | Kepayang | Very Low | Low | Very Low | Very Low | Very Low | Very Low | Very Low | Low | Low | High | Medium | Very Low | Very Low |
| **Banyuasin** | Sungsang IV | High | High | Very Low | Very Low | Very Low | Very Low | Low | High | High | Medium | High | Very Low | Very Low |
| | Muara Sungsang | Low | Low | Very Low | Low | Very Low | Very Low | Very Low | Medium | Medium | High | Medium | Very Low | Very Low |
| | Karang Anyar | Medium | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Medium | Low | Low | Medium | Very Low | Very Low |
| | Purwodadi | Low | Very Low | Very Low | High | Very Low | Very Low | Very Low | Low | Low | Medium | High | Very Low | Very Low |
| | Majuria | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | Very Low | High | High | Low | Medium | Very Low | Very Low |
| | Timbul Jaya | Low | Very Low | Very Low | Low | Very Low | Very Low | Low | Low | Medium | High | Medium | Very Low | Low |

*SOURCE: Household Survey*

## 3. Community Resilience & Ability to Cope

95. Resilience and adaptive capacity can be collectively thought of as the ability of a community to resist, absorb, recover from, and adapt to effects of climate change. Broadly speaking, 'resilience' is the inverse of vulnerability - resilient communities have learnt to adapt to, and cope with the effects of climate change, and thereby reducing their vulnerability and risk. Adaptive capacity is the ability of a community to adjust, modify or change its characteristics or actions to mitigate the potential impacts of climate change, or to enhance the ability of a community to cope with the consequences of climate change.'

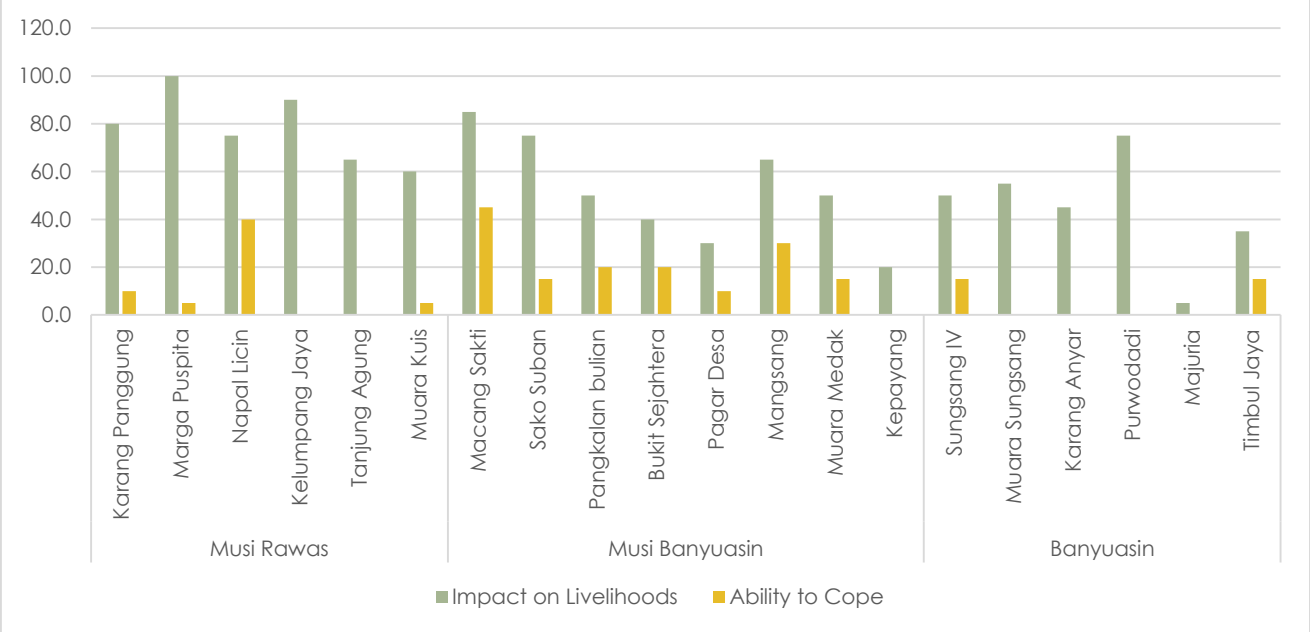
96. Overall, respondents were overwhelmingly of the opinion that a dryer climate and drought represented a higher climate hazard risk than flooding and a shift in the seasons. However, there was general consensus that:

- Increases in extreme rainfall events in the wet season will most likely lead to higher flood risk (such as the flood in 2013 which inundated a total of 20,973 houses in the six regencies in Sumatera Selatan – including Musi Banyuasin, Banyuasin, Muara Enim, Musi Rawas, Ogan Ilir, and Ogan Komering Ulu Timur);
- Decreases in rainfall during critical times of the year are likely to translate into high drought risk, uncertain water availability, and consequently, uncertain ability to produce agricultural goods, economic losses, and increases in the incidence of poverty and food insecurity;
- Delays in the onset of the wet season (monsoon) and a an increase in hot days could potentially threaten rice yields and incur a loss in farm-level incomes;
- A hotter, dryer climate, would most likely exacerbate the problems of wild fire, and this could have serious long term impacts on the livelihoods of people relying on rubber (as it did in 1997).

97. In stark contrast, whilst the majority of households recognized these potential risks, the general perception of 'future risk' was very low, with 42% of respondents saying there was no risk, and a further 42% and 14% respectively indicating that the risk from climate change was low to moderate. Only 2.5% of households thought that the future risks from climate change were high or extreme. This difference probably arises from the lack of understanding of climate change and how the likelihood of extreme events will increase over time – and how this relates to 'natural hazards' such as flooding that occurs on a regular basis in the study area.

98. When asked about the potential impacts on household livelihoods and their ability to cope, the majority of respondents were very clear, with 57% of households of the belief that climate change would have an adverse impact on their livelihoods and only 12% of respondents of the opinion that they would be able to cope with these impacts (as illustrated in Figure ## below).

*Figure 24 Impact of Climate Change on Household Livelihoods and their Ability to Cope*




SOURCE: Household Survey

99. Further to this, only 7.8% of households in the study area are actively implementing adaptation measures (with most of these are by people living in Timbul Jaya, Majuria, Muara Sungsang, Sungsang IV and Karang Anyar in Banyuasin who are exposed to seasonal flooding and coastal inundation) and 87.5% of people of the opinion that the institutional capacity at the village and district level was not sufficient to meet current or future needs.

# IV. Conclusions

## A. Key Findings

100. The purpose of this study was to establish a 'Socio-Economic Vulnerability Assessment and Baseline Study' for 20 forest dependent communities located within Musi Rawas, Musi Banyuasin and Banyuasin regencies in Sumatera Selatan, that were identified as potential 'target communities' for the Biodiversity and Climate Change Program (BIOCLIME) in South Sumatra, Indonesia.

101. It is envisaged that the BIOCLIME program will make a significant contribution to climate mitigation targets in Indonesia through the development of a range of pilot demonstration sites and measures for achieving REDD+ outcomes by focusing on a range of activities including: the reduction and fragmentation of important habitats and areas of high biodiversity conservation areas; the sustainable protection, management and use of forest ecosystems; increased capacity of local government institutions and communities (relevant stakeholders) to plan and implement participatory conservation and management concepts and activities; and the identification and promotion of alternative sources of income from protected forest and conservation areas for communities living in core and buffer zones.

102. In order to achieve this GIZ will specifically focus on developing an approach for the protection and sustainable management of forests of high conservation value that is acceptable to local people, the private sector and policy makers. Improved forest management including restoration of natural degraded forest will only be achieved if tangible economic incentives are provided in conjunction with meaningful environmental and social safeguards, including upholding the rights of local communities.

103. This study was designed to establish a comprehensive socio-economic baseline for the project, and to analyze the vulnerability of the target population. As previously discussed, for this study 'vulnerability' is defined in terms of 'the factors that make individuals, populations and natural and human systems more or less likely to experience adverse outcomes when exposed to an external stress', and this includes background socio-economic vulnerability and the vulnerability of the local population to natural hazards and climate change.

104. In order to capture and analyze the factors that make individuals, populations and natural and human systems vulnerable we adopted a community-based approach to evaluate the comparative socio-economic vulnerability of each community (and their natural resources) to climate change and other natural hazards.

105. This approach is extremely simple in that it entails only minor extension of the standard approach to establishing a socio-economic baseline for a project. In this context vulnerability is seen as the outcome of a mixture of environmental, social, cultural, institutional, and economic structures, and processes related to exposure to hazards, shocks and external stresses, and the ability to cope with or adapt to these risks. It involves the analysis of multiple dimensions of vulnerability, comprising a range of economic, social, environmental (biodiversity) and climate change indicators that can be quantified through a combination of primary data (field surveys) and secondary data (official statistics and reports).

106. From this perspective, the degree of vulnerability of an individual, households or community is determined by their exposure to the risk factors and their ability to cope with or withstand stressful situations. And in this context we use the sustainable livelihoods approach (SLA) to determine the relative vulnerability of rural livelihoods across the study area to various sources of stress, including population pressure, poverty, food security and livelihoods as perceived by survey participants, so as to understand people's resilience and adaptive capacity.

107. Using this framework we were able to analyze and rank vulnerability on a site by site basis based on existing socio-economic conditions at the village and household levels and on levels of threat to the natural and human systems, and the key findings from this analysis are summarized below:

a) **Population & People**: The study found that whilst population was considered essential part of the analysis, population densities were on average very low and population pressure was not seen as a major driver of vulnerability within the study area. However, with regard to age structure, the general population of Sumatra Selatan is proportionally very young, with over 30% of the population being under 30 years of age. From the households surveyed, approximately 35% of the population are under the age of 17 Years old. Combined with relatively high growth rates and the prevalence of multiple family households would imply that population pressure on land resources into the future could be problematic, even though population densities are relatively low.

b) **Socio-Economic Vulnerability**: The socio-economic composition of communities varies throughout study area from small newly established villages comprising of new immigrants, through to transmigrassi villages and old well established indigenous villages. Because of this diversity in terms of size and development patterns, the background socio-economic and cultural factors that influence their resilience and adaptability to climate change also vary across the region. The study found that whilst there was a high level of ethnic diversity, language and culture across all 3 regencies, this diversity was not a major driver contributing to social inequality and disadvantage – and did not influence the ability of a households or community to participate in and benefit from the broader socio-economic development in the region.

c) **Poverty Incidence**: Poverty levels are relatively high in the study area, with 20 to 80% of households being assessed as 'poor' or 'very poor', primarily on the basis of non-monetary indicators. However, household incomes in the survey area were surprisingly high, with all of the villages surveyed having average annual incomes equal to or greater than the poverty line for Sumatra Selatan (i.e. Rp 9,253,192). The villages with the highest incidence of poor households include Pagar Desa, Muara Kuis and Napal Licin. Napal Licin and Muara Kuis have more than 50% of households classified as poor, incomes are around 945,000/month, land ownership is less than 1 ha/household, infrastructure is poor and the people majority household heads have no formal education.

d) **Livelihood Systems**: The study identified distinct livelihood system in the study area, these being: the Smallholder Plantation, Agriculture and Agroforestry System; and the Integrated Coastal Agriculture and Fishing System. Both systems are considered to be highly vulnerable due to high reliance on their respective natural resource base. However, as you would expect the coastal system was found to be the most vulnerable to the effects of climate change, primarily relating to the exposure of this lowland system to the combined effects of flooding and inundation from sea level rise. The Smallholder Plantation was found to less susceptible to flooding, it was considered to be highly vulnerable to the effects of a dryer climate, drought and wild fire.

e) **Biodiversity Conservation & Forest Use**: The study area includes a number of important conservation areas and protected forests including: Sembilang National Park; Kerinci Seblat National Park; Bentayan Wildlife Reserve; Dangku Wildlife Reserve; Punti Kayu Nature Recreation Park; Terusan Dalam Game Reserve; and Padang Sugihan Wildlife Reserve. Whilst there are significant areas of protected forest and conservation forest in the study area, only 1 in 3 households recognized the benefits of forest protection. Support for forest protection was

highest in Musi Rawas, and it is fair to say that these villages rely on forests and forest products for their livelihoods. In contrast, the villages in Banyuasin rely on rice, coconuts and fishing for their livelihoods, and most likely only benefit from the Fuelwood collection and the collection of shellfish from within the protected forest. Whilst it is clear that the majority of households in the study area are sourcing forest products from either their own lands (29%, or from community forest (53%), 15% of households are sourcing products from protection forests, and it is highly likely that illegal harvesting and collection of forest products is occurring in forests have been set aside for biodiversity conservation such as Sembilang National Park where satellite imagery shows forest clearing and degradation associated with encroachment (for shrimp farming) and illegal harvesting of mangroves for fuel wood. Nevertheless, a number of the villages surveyed indicated that they were interested in, or had plans to expand community based forestry in their areas, especially villages of Marga Puspita, Tanjung Agung and Karang Panggung in Musi Rawas. This is not surprising given the relative importance of forestry to household livelihoods in those villages, and their general reliance on forest products for income, as opposed to the villages in Banyuasin who derive their livelihoods from agriculture and fishing.

f) **Climate Change**: Due to its geographical location, topography and socioeconomic aspects, Indonesia is especially vulnerable to the impacts of climate variability and climate change. There is evidence that the impacts of climate change are already being felt in Sumatera Selatan, and future projections indicate that it is highly likely that the province will become increasingly vulnerable to the effects of climate change. The most important effects of climate change on forest dependent communities in study area will be:

- Higher temperatures and decreases in rainfall is likely to have a significant impact on the natural forest ecosystems in the study area, including changes in species distributions, range and refugia;
- With increased rainfall in the monsoon, it is expected that we will also see enhanced runoff that could lead to enhanced top soil erosion and overall habitat degradation of forest ecosystems, especially in upland forest areas used for slash and burn agriculture;
- Increased runoff could also cause recurring floods in many areas (especially in those areas already prone to flooding) and longer residence time for flood water which will have an impact on paddy rice production and the survival of plantation crops in the lower lying forest areas;
- The increased risk of forest fire due to decreasing dry season rainfall and shortening of the length of the wet season in some part of the region associated with the El Niño

phenomena. Sumatera Selatan is already exposed to high risk of fire, and CIFOR recently found that future risk of fi res in parts of Sumatera Selatan would be greater than in the past due to an increase in average drought indices and the number of days with 'extreme' danger rating;

- Long dry seasons during El Niño years significantly affect not only annual crops, but also perennial forest crops due to the impact of a longer dry season on propagation, fruiting and survival of young plants. Based on observations in a number of locations, the average young plant dieback for tea crops was approximately 22%, between 4% and 9% for rubber, about 4% for cacao, between 1.5% and 11% for cashew nuts, about 4% for coffee and between 5% and 30%for coconut. For mature plantation crops such as coconut and palm oil, the impact of severe drought appears after 4-9 months (Hasan et al., 1998).

108. The study also found that these impacts will directly influence not only forest ecosystems, but more importantly the socio-economic status of the communities and households in Sumatera Selatan who rely on forest lands and coastal resources for their livelihoods. The forest ecosystem that many of the communities are dependent on for their livelihoods would therefore, become more vulnerable due to the effects of climate change. Reductions in availability of plant and animal species (due to temperature increases) on which remote rural forest communities depend for subsistence and cash income (e.g. NTFPs) and the physical damage and increased isolation from flooding, e.g. access to markets, training and extension services, have the potential to undermine community welfare and resilience.

## B. Adaptation Options for Reducing Vulnerability

109. The challenge for the BIOCLIME program is to create appropriate and effective adaptation strategies to address climate change and its impacts by building resilience and resistance. Action needs to be taken at all levels; from regional through to local government and village levels. Because climate change will compound environmental and socio-economic problems, it is critical that all of the project activities include climate change adaptation and resilience building components or thinking.

110. Results from the study indicate that reducing background socio-economic vulnerability is the key means by which the project can build resilience and reduce the vulnerability across at the community level within the study area. More specifically it is suggested that GIZ focus on improving the sustainability of the current livelihood systems in the first instance through training and capacity building – and then look to opportunities to diversify income sources through supplementary agroforestry and livestock production systems.

111. Increasing the diversity and the intensity of both livelihood systems would significantly help to build resilience and reduce vulnerability; achieving this goal, however, depends on reducing the productivity gap between the traditional agricultural system and a the more modern smallholder plantation and agroforestry technologies adopted in other parts of the country. Achieving sustainable agricultural growth and livelihood improvements will also require supporting investments in market chain development, small enterprise and business development and the formation of cooperatives (or Kelompok's) to improve transportation, storage, marketing and the terms of trade.

112. The study also emphasizes the need for locally differentiated strategies in response to both the different livelihood systems, but also relative exposure and sensitivity of the natural resources that underpin the respective systems. Given the distinct nature of the climate hazards and risks between the 3 regencies, it will not be sufficient to focus on adapting livelihood alone. A balanced approach to livelihood diversification must be accompanied by strategies to reduce the risks from flooding, inundation, drought, wildfire and changes in seasonality.

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