



Contributing to poverty Alleviation through Regional Energy Planning in Indonesia

Work Package 2: Identification of Energy-Related Needs and Priorities of Poor Communities

Location: Sitardas Village, Tapanuli Tengah, North Sumatera



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1. Introduction

CAREPI project aims to develop the institutional capability and technical capacity in some regions in Indonesia to implement the study of energy policy and improve energy services for the poor, in order to eradicate poverty and support sustainable development. Four regions is chosen as the location of activities, namely: North Sumatra, Central Java, Yogyakarta, and Nusa Tenggara.

One factors that indicate a people under the poverty line is avaiability of access to modern energy resources. Therefore, it is necessary to identify an initial effort in providing access to modern energy for the poor.

1.1. The Concept of Poverty and Poverty Level

Poverty is one of the fundamental issues for developing countries including Indonesia. One important aspect to support poverty reduction is the availability of poverty data accurately and effectively. Such poverty data can be used for evaluated the government policies against poverty; the poverty among and between the regions; and determine the poor population target with the aim to improve their condition.

Poverty can be regarded as a condition where a person or a group of people, not able to meet their fundamental rights to develop and maintain a life of dignity. The definition of fundamental rights included the need for adequate food, health, education, employment, housing, water, natural resources and the environment, safe from violence threats or treatment; and rights to participate in the social-political life.

Poverty can also be seen as a lack of both material and non-material. Lack of material among the low income and lack of expenditure/expense. While the lack of non-material are: a low level of health; a low level of education; and socially and politically isolated.

Measurement of poverty can be done with a quantitative approach (monetary) or qualitative (non-monetary). Each has a different indicator. Income per capita and expenditure per capita is used as an indicator in the quantitative approach. Indicators qualitative approach, including: individual indicator, the indicator of households, access to modern energy resources, and other social exclusion.

The concept of poverty used by the Central Bureau of Statistics (BPS) based on economic aspect. Poverty is seen as the inability to meet the basic needs of food and non food. Poor people is people who have an average expenditure per capita per month under the Poverty Line. Component Poverty Line (GK) is the Food Poverty Line (GKM) and Non-Food Poverty Line (GKMN).

$$OK = OK_{\text{basic}} + OK_{\text{non-basic}}$$

Basic needs of food equivalent to the fulfillment in 2100 kkal calories per capita per day. Package basic food commodities represented by 52 types of commodities (grains, tubers, fish, meat, eggs and milk, vegetables, nuts, fruits, oil and fat, etc.). Non-food basic needs is a minimum requirement for housing, clothing, education and health. Package non-food basic needs represented by 51 types of commodities in urban areas and 47 types of commodities in rural areas.

Poverty indicators consist of:

Headcount Index: measures the percentage of poor population to total population;

Poverty Gap Index: is the size of the expenditure average gap in each of the poor against poverty line. The higher the index value, the population expenditure average distance from the poverty line; and

Poverty Severity Index: the higher the index value, the higher the imbalance between the expenditure of poor people.

$$P_n = \frac{1}{n} \sum_{i=1}^q [Z - y_i]^{\alpha}$$

The size of the poverty rate based on the formula Foster-Greer-Thorbecke is:

where :

- Z = poverty line
- y_i = average expenditure per capita per month under poverty line
- q = the number of people living below the poverty line
- n = total population
- α = 0, *head count index*, % poor people
- α = 1, *poverty gap*
- α = 2, *poverty severity index*

World Bank applied its own approach to the problem of poverty. To compare poverty across countries, the World Bank Poverty Lines calculated using the estimates of consumption converted into US\$ PPP (Purchasing Power Parity) which is not the official exchange rate of US\$. PPP conversion number shows the amount of rupiah spent to buy some goods and services where the same amount can be purchased for US\$ 1 in the United States. This number is calculated based on the conversion price and quantity in each country which is collected in a survey that is conducted every five years.

1.2. North Sumatera Province Poverty Profile

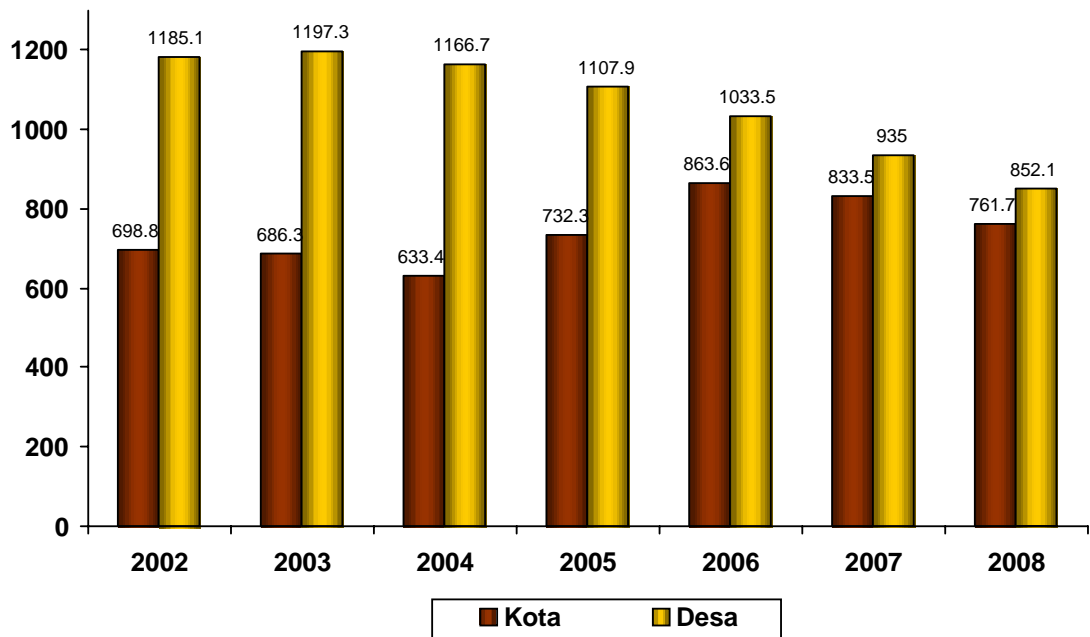
North Sumatera province, one of the regions on CAREPI project, are in western Indonesia. Located at 1° - 4° N and 98° - 100° E. Bordered at the north with Nangroe Aceh Darussalam, at the east with Malacca Straits, at the south with Riau and West Sumatera province; and at the west with Hindia Ocean.



Figure 1. Cities/Districts in North Sumatera Province

The number of poor people in North Sumatra fluctuated from year 1993 to 2008. Number of poor people population in 1993 is 1.33 million or 12.31% of total population. In 1996 the poor people population only 1.23 million or 10.92%. But as the financial crisis, including the most of North Sumatra, the poor people in 1999 increased to 16.74% of the total population or 1.97 million. In 2003, poor people declined both in absolute and percentage, became 1.89 million, or approximately 15.89%, while in 2004 the number and percentage down to 1.80 million people or approximately 14.93% and then in 2005 the poor people became 1.76 million (14.28%), but due to the impact of fuel price increased in March and October 2005 the population poor in 2006 increased to 1.98 million (15.66%).

Based on the results of SUSENAS made in March 2008, the number of poor people (the population is under the Poverty Line) in North Sumatra in March 2008 of 1,613,800 people (12.55%). Compared with the poor residents in March 2007, amounting to 1,768,400 people (13.90%), mean number of poor people down as many as 154,600 people. If compared with the number of people living both in rural and urban areas, the percentage of poor people in rural areas is only 12.29%, while in urban areas was 12.85%.



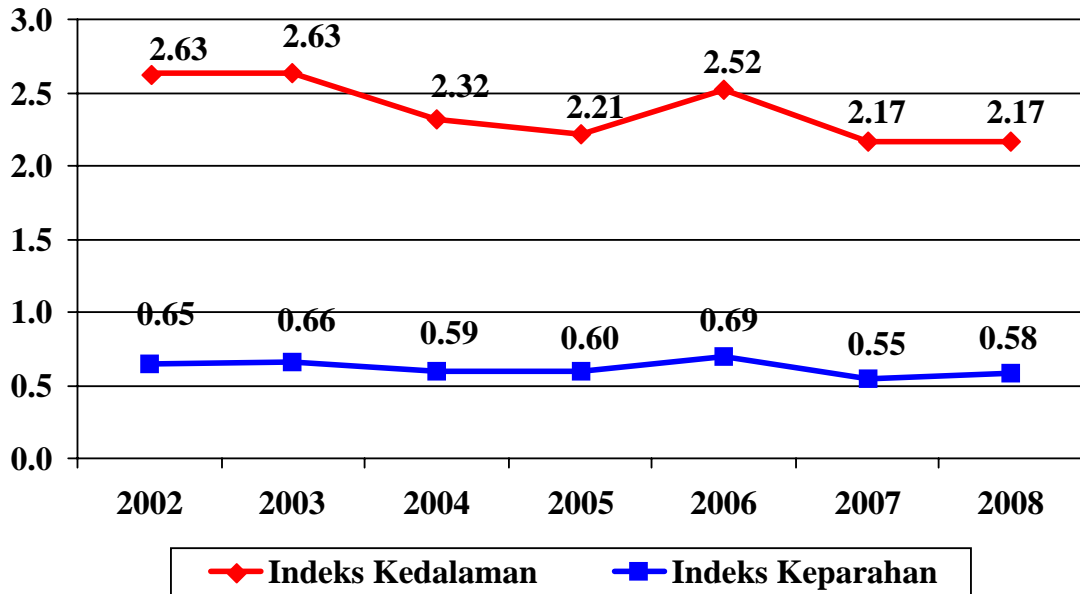
Gambar 2. Poor people growth at North Sumatera Province 2002 - 2008

The number of poor people is strongly influenced by Poverty Line, because the population is poor people who have an average expenditure per capita per month under the Poverty Line. The poverty line of North Sumatra in March 2008 is Rp.193,321 per capita per month. For urban poverty lines is Rp.218,333 per capita per month and for rural areas Rp.171,922 per capita per month. During February 2004 to March 2008 the poverty line of North Sumatra rose 57.92%, which increased to 52.72% in urban and in rural areas rose 50.53%.

Role of food commodities to the poverty line were far greater than the role of non-food commodities such as housing, clothing, education, and health. In March 2008, donations of food poverty line to the total poverty line is 76.88%.

Depth Poverty Index Value (P1) and Poverty Severity Index (P2) in the urban areas in March 2008 is lower than in rural areas. In March 2008, the Poverty Depth Index (P1) is only 2.08 for urban areas while in rural areas reached 2.25. Poverty Severity Index Value (P2) is only 0.50 for urban areas while in rural areas reached 0.64. Based on the depth of poverty index and poverty severity

index can be concluded that the level of poverty in rural areas more severe than the urban areas.



Gambar 3. P1 and P2 growth in North Sumatera Province 2002 - 2008

2. Overview Surveyed Location

2.1. General Description Central Tapanuli District

Central Tapanuli district is located in the coastal West Sumatera island with the length of 200 km coastline and most of the region are in the mainland of Sumatra island and small parts of the district on the other small islands. Central Tapanuli is one of the districts in North Sumatera Province with area of 6,194.98 km² covering land and sea with carpet mountains, beach and sea.

Areas of the strategic location, great potential of natural resources diversity and a great harmony of multi-ethnic community causes Central Tapanuli as a hidden jewel that will be very valuable and shimmer with a touch of accelerated development and increased investment.

Central Tapanuli is located at the 1° 11' 00" - 2° 22' 0" N and 98° 07' - 98° 12' E, with total area 6,194.98 km² consisting of 2,194.98 km² land and 4,000 km² sea. Central Tapanuli area bordered in the north with the District of Aceh Singkil (Nanggroe Aceh Darussalam Province), eastern with North Tapanuli district , Humbang Hasundutan district and West Pakpak district; southern with South Tapanuli district; western with Sibolga City and Indonesia Ocean.

TOPOGRAPHY



Most Central Tapanuli topography is hilly with an altitude of 0 - 1,266 meters above the sea level. 43.90% of all parts Central Tapanuli is hilly and bumpy.

CLIMATOLOGY

Most regions in Central Tapanuli district bordered by sea. The sea air affect the temperature that classified as tropical regions. In the period January - December 2006, the maximum temperature can reach 31.53°C and minimum temperature reached 21.72°C. The average temperature in 2005 is 26.09°C. Dry season usually occurs in June through September, the rainy season usually occurs months November to March.

In 2006, the average rainfall of 4,925.9 mm, with 226 days as rainy days, average wind speed of 6.7 knots and average evaporation 4.6 mm. The average humidity of 84.58%.

HYDROLOGY

Hydrological resources is important to support the development, both for drinking water, irrigation, transportation, and for the benefit of the other. Central Tapanuli regions affected by the four Regional River Flow (DAS), namely Batang Toru, Tapus, AEK Sibundong, and Sirahar. Headwaters of the rivers originating from Bukit Barisan mountain and the estuary to the West Coast of North Sumatra. In general, rivers have short flow, steep and narrow. Some rivers have been used for the power plant, such as river flow Sibuluan for PLTA Sipan Sihaporas and for drinking water and irrigation.

GOVERNMENT

Central Tapanuli district government formed on 24 August 1945. The capital city of Central Tapanuli is Pandan. In May 2007, Central Tapanuli district government administratively consists of 19 subdistricts, 24 wards and 154 villages. Subdistricts in Central Tapanuli district are: Manduamas, Sirandorong, Andam Dewi, Barus, North Barus, Sosorgadong, Sorkam West, Sorkam, Pasaribu Tobing, Kolang, Tapian Nauli, Sitahuis, Pandan, Tukka, Badiri, Pinangsori, Lumut, Sibabangun, and Suka Bangun. Sarudik subdistrict become the 20th subdistricts in December 2007.

Of the subdistrict is intended to further expedite the process of regional development, improve the capacity and quality of the district government in carrying out the governance, development, and public services and basic services to the community. The number of Legislative Council of the Regional Representative Central Tapanuli at this time are 29 people.

DEMOGRAPHY



Central Tapanuli population in 2006 amounted to 297,846 inhabitants with a density of 136 inhabitants per km². Population growth in period 2000-2005 was 1.86% per year. Composition of the population in the Central Tapanuli 50.20% male and 49.80% women. The most employment in 2005 is in process industry subsector at private companies.

Central Tapanuli population consists of multi-ethnic tribes namely Batak, Minangkabau, Java - Madura, Bugis, Chinese, Aceh, Malay, Sundanese, and others, with the majority of the Batak tribe. Harmony, security, order and tolerance in the spirit of mutual help have been exist, making Central Tapanuli more conducive and respited socially in the globalization of various changes. Economics fundamental problems of Central Tapanuli, as well as other areas in the western regions in North Sumatra is: POVERTY and UNEMPLOYMNET.

The limitations that encompass the problem is hilly topography of Central Tapanuli (Bukit Barisan), limited human resources, limited of natural resources management, limited infrastructure, limited access to information and limited capital flows.

Central Tapanuli district government are working to overcome the problem with the acceleration of development and increase regional economic growth primarily through investment both private and public investment to raise the standard of living and welfare of the people with Tapanuli Growth development concept. Implementation of the development acceleration since 2001 until now has shown significant results with the employment improvement through the new investment and infrastructure development that will encourage improvements.

In general, the dominant field of business in Central Tapanuli district are Agriculture, Process Industry and Services. Society is made up of fishermen and farmers. Farmers are planting rice, horticultural crops and livestock. The dominant bussiness services is trading activities of eminent agriculture products commodity and handicraft products/home industries, in addition to other services such as transportation, communication and banking/financial institutions. Processing industry includes results-based fisheries and plantations.

ENERGY POTENTIAL

Potential energy in Central Tapanuli district includes primary and electric energy potential.

Primary energy potential includes:

Coal: capacity > 10,000,000 m³ in Kec. Kolang and Kec. Tapan Nauli (tereka reserved);

Water-fall Mursala Island: capacity/debit ± 10 m³/sec in the Kec. Tapan Nauli, high fall ± 50 m;

Water-fall Parliang-liangan: ± 0.6 m³/sec in the Simanosor village, Kec. Sibabangun, high fall ± 30 m;

Water-fall Sampuran Silaklak: ± 1 m³ / sec in the Unte Mungkur II village, Kec. Kolang, high fall ± 50 m;

Water-fall Pancuran Mungkur: ± 0.5 m³/sec in the Hurlang village, Kec. Kolang, high fall ± 25 m;

Water-fall Labuan Bodil: ± 0.5 m³/sec in the PO Hurlang village, Kec. Kolang, high fall ± 10 m;

Water-fall Aek Paroman: ± 0.6 m³/sec in the Tapan Nauli Saurmargita village Kec. Tukka, high fall ± 25 m; and

Water-fall Sampuran Silayap: ± 0.9 m³/sec in the Tapan Nauli Saurmargita village, Kec. Tukka, high fall ± 50 m.

Electrical energy potential includes:

PLTA SIPAN SIHAPORAS capacity 50 MW in Sipan Sihaporas village, Kec. Pandan (already connected to the grid).

PLTU BATUBARA LABUAN ANGIN capacity 2 x 115 MW, Labuan Angin Tapan Nauli II village, Kec. Tapan Nauli.

2.2. Sitardas Village Profile

The Sitardas village is located near by the sea, land altitude at 0 to 500 meters above sea level, consisting of plains and hills. Around 350 km from Kota Medan (capital of North Sumatera Province).

Sitardas Village is bordered at the north by Jago-Jago village, at the south with Pulo Pakkat (Batang Toru, South Tapanuli district), the east with Pinang Sori, and the west with the Indonesian Ocean. Sitardas Village consists of three (3) lanes, namely Kampung Sawah, Jambak Toba, and Sawangan Rambutan (Kampung Pandan). Location of each lane is separate apart. Among those three lanes, Kampung Sawah is located near the shore and less developed rural area compared with another lanes. This condition became the consideration in determining the survey location.

The exact survey location is at Kampung Sawah, Sitardas village, Badari subdistrict, Central Tapanuli district. This village can be reached through the sea using small boats from Hajoran village, which is about 10 km (or about 10-15 minutes by car) from Pandan which is the capital of Central Tapanuli, or travel through the road from Hutabalang village (around 12 km to the southeast Hajoran village). Road condition from Hajoran village to the Kampung Sawah (Sitardas village) is bad. The distance between the village is only about 14 km, people usually used a motorcycle through that road. Access to the Sitardas village practically not available if rainfall level is high, because the road will be turned into mud. In bad weather access through the sea is also not available. In conditions like this, Sitardas village practically become into isolated village.

2.3. Social-Economic Condition

DEMOGRAPHY

Kampung Sawah consists of 63 families that are part of the 121 families residing in the Sitardas village. Each family has an average of 4 to 5 members. Until August 2008, the population of the Sitardas village is 534 people.

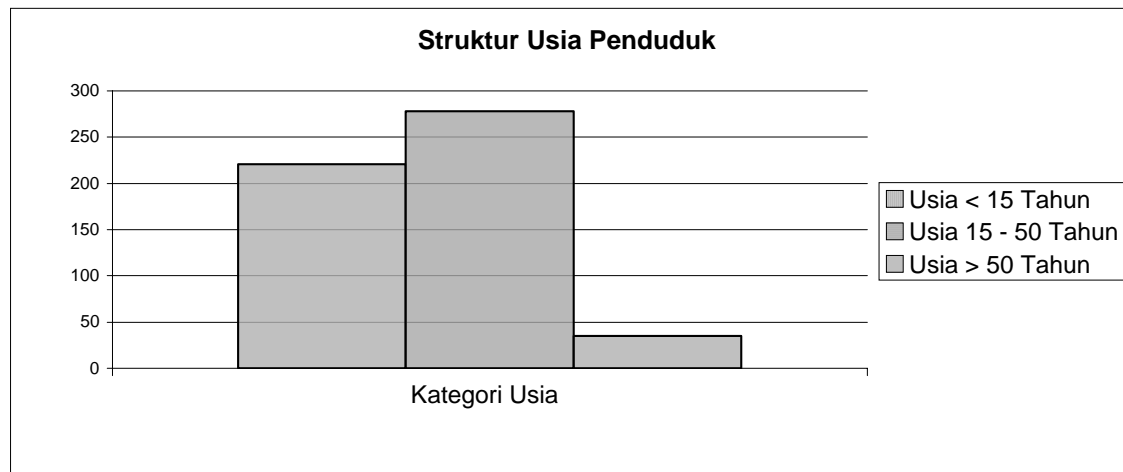


Figure 4. Population composition based on age

Population composition based on sex type is almost equity. The male population is 278 and female population is 256. Number of people aged between 15 to 50 years of age is the most, the number reached 278 people, while the population under the age of 15 years amounted to 221 people, and above 50 years as many as 35 people. Based on the age structure, the comparison productive and non-productive people is nearly equal, in other words the burden of indemnity for productive people to non-productive people is 1:1.

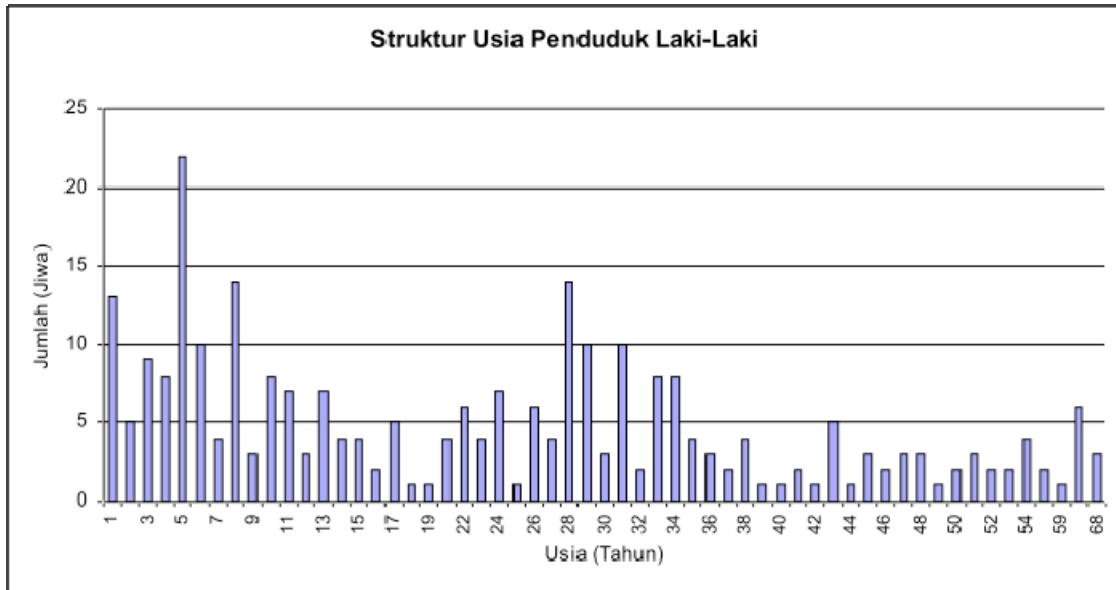


Figure 5. Age structure male population

Description of population by age shows that age structure of men with women have a similar pattern. Age composition is dominated by age under 10 years old and population aged 25 to 35 years old. Thus, the Sitardas village is a village that has a productive population and the potential of productive population (young generation) to 15 years later.

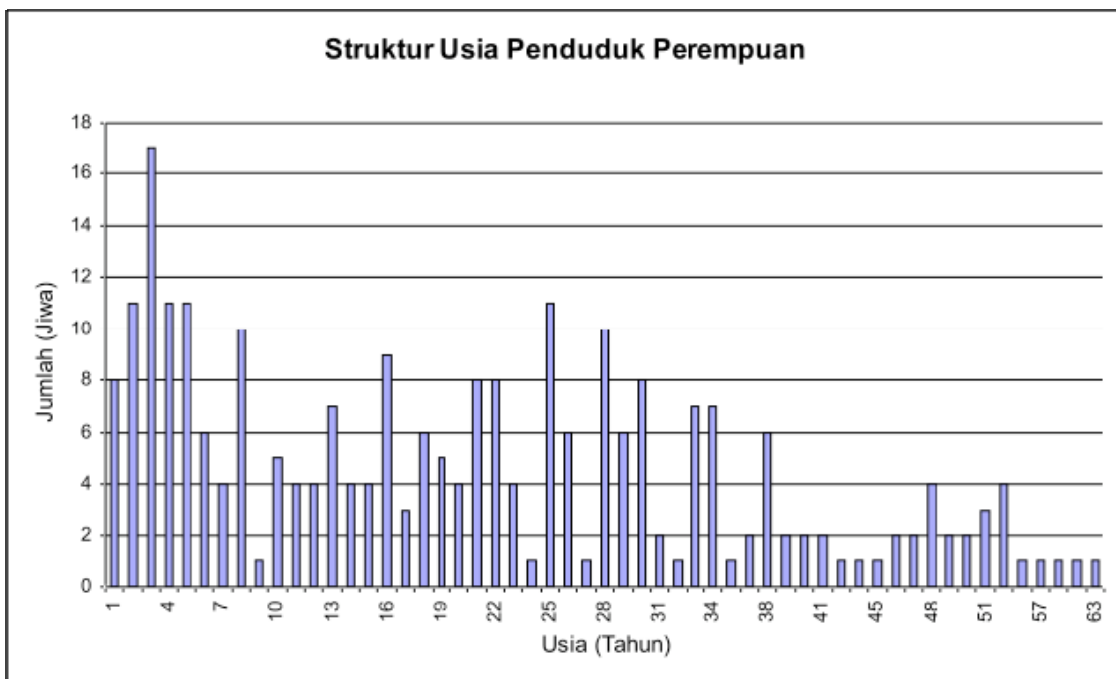


Figure 6. Age structure female population

EDUCATION AND INCOME

Kampung Sawah, located near by the beach is quite isolated lane. The population in this lane generally work as fishermen and farmer, with the income of Rp 500,000 to Rp 3,000,0000 per month. In the agriculture field, the population working at palm oil plantation and coconut plantations.

Education level is quite low, generally people only passed elementary level (Sekolah Dasar). Number of pre-school people, people studying in elementary level, people who have not passed elementary level, passed elementary level but discontinued from higher education level is about 470 people, almost 88% from total population.

GOVERNMENT

Sitardas village led by a Chief of the Village, under the village chief is the chief of a lane. Smallest leaders is hamlet chief whose authority region is under the chief lane.

Sitardas village does not have any indigenous institutions, its population is still quite traditional, highly respect to the people who have magical power. The only social institution is the village/lane.

Sitardas village known as a relatively poor village in Central Tapanuli district and have been received some assistance from international organization. Until August 2008, the last international projects in Sitardas is COREMAP. The project develop/built information center and meeting hall. COREMAP aims to empower citizens in the protection of coral reefs.

PUBLIC FACILITIES

Kampung Sawah have very minimal public facilities, some of those are not feasible to use anymore. The public facilities in Kampung Sawah are:

- 1(one) Mosque
- 1(one) Elementary School (not feasible to use)
- 1 (one) Health Service Post (Posyandu, not feasible to use)
- 1 (one) Public Hall

INFRASTRUCTURE

Infrastructure condition in Kampung Sawah is very apprehensive. In this village there is no road and water networks, drainage, and others. Housing residents are very dirty and chaotic. Public transportation is not available, people generally used a boat for travelling to other areas. Only six household have a boat, the rests generally request to joint with the boat owner for travelling.

2.4. Energy Consumption

Kampung Sawah lane is off-grid electricity region. Thus, people used another energy resources for electricity needs, both for lightning and also for information media (Radio, TV).

Generally, the energy consumption for Sitardas village could be define base on resources, namely:

Firewood: people use firewood for cooking purposes. Wood was collected from many mangroves along the coast Sitardas, without damaging the mangroves environment itself. Generally, people take in the amount of wood more than one day needs. The goal is for stocks, so that they do not need to collecting firewood every day.

Kerosene: some people use kerosene as a substitute for firewood for cooking purposes. Average kerosene needs for one house are 2 - 4 liters per day.

Premium (gasoline): premium used for gen-set to produce electricity and also for the boat. Not all households have a gen-set and the boat. Households that have gen-set as electricity is only 10 (ten) of households. Gen-set is only operated at night with an average consumption of premium, 4 - 6 liters/gen-set/day. Electricity produced by the gen-set is distributed to some households that do not have one. In addition to lighting, electricity also used for other electrical equipment, especially the television as media information and entertainment for the villagers. Boats used for fishing, on average require 20 - 30 liters/boat to sail for once (approximately 1 - 2 weeks).

Avaiability of kerosene and premium depends on the weather. In the bad weather conditions, the villagers can not purchase either through land or sea, because the dissolution of all transportation. In the normal condition, the two energy sources are also relatively much more expensive than the market price.

3. Demand and Priority Related to Energy

Collecting information on energy related needs obtained through direct discussions with community leaders and the influential head of Kampung Sawah lane. Based on the discussion some of the information obtained relating to the energy needs and supporting activities to increase the population income.

Needs related to energy are:

a. Availability of Electric Energy

In the electricity field Central Tapanuli district government has a plan to meet electricity needs. Development of some power plant which is located in Central Tapanuli is the realization of the planning. Among the plants included in the plan are:

- i. Hydro Power Electricity Plant (PLTA) Sipan Sihaporas; consists of two plants each with a capacity of 33 MW and 17 MW. Contribution PLTA Sipan Sihaporas overall is 50 MW and currently are connected with the electrical network system Sumbagut, Aceh and Riau.
- ii. Steam Power Electricity Plant (Coals PLTU) Labuan Angin built in Labuan Angin Strategic Regions, Subdistrict Tapan Nauli, Central Tapanuli. Coal PLTU Labuan Angin plant has a capacity of 2x115 MW. Currently PLTU Labuan Angin Unit I has been operating with a capacity of 115 MW power. Scheduled in April 2009, Unit II PLTU Labuan Angin have been able to operate.
- iii. Coal PLTU Sitardas with a capacity 2x100 MW located in the Village Sitardas, Subdistrict Baduri. The location is very close to the Kampung Sawah lane. However, until this time there is no clarity of construction.

If viewed from the existing plants, very possible to deliver electricity to the Sitardas village. However, the electricity network currently not available to Sitardas village.

b. Continuity supply of kerosene and premium

To get kerosene and premium, Kampung Sawah lane residents must buy them to the Hajoran village that the shortest distance through the sea. Or to the Hutabalang village which can be reached overland using vehicle motorcycle. In bad weather conditions (rain and gale), access to the Hajoran village and Hutabalang village can not be done. So that, Kampung Sawah residents rely solely on firewood for cooking. Fishing activities is also suspends.

4. Options to Overcome the Problems

Natural resources found in the Kampung Sawah lane is limited. Spring with a high fall and sufficient debit to create a microhydro power is no longer available today. Spring can only be used as a source of clean water for residents in Kampung Sawah lane.

Based on climatology data and topographic conditions in Kampung Sawah, options that allow to overcome the difficulty in access to modern energy sources is to utilize solar power.

4.1. Calculations for Electricity Needs

The electricity mainly used for lighting. The number of household in Kampung Sawah lane is 63 house. In average, each house has two rooms which are bedroom and living room. The living room also have a function as kitchen. Each room estimated needs 20 watt lamp for lighting. Then, each house need 40 watts for lighting. With 12 Vdc source, the current needs to drive the lamps is 3.34 Ampere. With one 12 Volt 100 Ampere-Hours battery, the lamps will lights for 29 hours more or less. It is sufficient if each house needs 5 - 6 hours per day for lighting.

Estimated investment costs to build the 12 Volt home solar system with are:

Solar Panel 1x75 Wp	: Rp. 3,000,000
Solar charge controller 10 Ampere PWM	: Rp. 450,000
Battery deep-cycle 100 Ampere-Hours	: Rp. 2,250,000
12 Volt DC Lamps 2x20 Watt	: Rp. 210,000
Cables and Accessories 1 lot	: Rp. 1,000,000
T O T A L	: Rp. 6,910,000

Assumed average kerosene consumption for lighting is 1 litre per day. Official kerosene highest retail price for Central Tapanuli district is Rp. 2,250 per litre, but at Kampung Sawah lane this could be reached Rp. 5,000 per litre. Thus, every house spends Rp. 150,000 per months for buying kerosene. The investment for home solar system will return in 47 months (3.8 years), if installment is Rp. 150,000 per months.

4.2. Substitute kerosene with LPG

Kerosene have been using for lighting and cooking. Currently Kampung Sawah lane residents use kerosene or firewood for cooking. Assumed kerosene consumption is 3 litre per day per household (1 litre for lighting, 2 litres for cooking) then for cooking each household have to spend Rp. 300,000 for kerosene.

Assumed five LPG 3 KG is used as substitute for kerosene each month, then costs for LPG is Rp. 63,500 per month per household, saving Rp. 236,500. In the beginning of substitution kerosene with LPG, we also have to provide the stove. In the market, we could get a simple stove for Rp. 230,000, this means the costs for stove could covered by the saved costs on the first months.

5. Recommendations and Conclusions

The recommendations and/or conclusions for Kampung Sawah lane are:

1. Based on the survey result, access to modern energy for Kampung Sawah lane could be done by providing the electricity and LPG. The electricity with PV-based could be an alternative as electricity source for Kampung Sawah lane.
2. While providing the LPG as substitute for kerosene, the continuity of LPG supply have to be the main concern.
3. The road and irrigation network at Kampung Sawah lane should be build or renovating, so as the public facilities to support the economic activities and



maintain the public healthy. The development of road and irrigation network could be done by Central Tapanuli district government. The district government could allocating the budget in APBD.