International Journal of Management Technology
Vol.2, No.1, pp.1-28, pp. March 2014
Published by European Centre for Research Training and Development UK (www.ea-journals.org)

DEVELOPMENT MODEL OF RENEWABLE ENERGY POLICY BASED ON SOCIAL FORESTRY FOR SUSTAINABLE BIOMASS INDUSTRY USING ISM METHOD

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Abstract: *New and renewable energy development should be encouraged because Indonesia is net importer of oil. Government subsidy for transportation and electricity is more than 300 trillion rupiahs per year. Presidential Decree No. 5, 2006, mandates that energy mix target by 2025 is 17% for new and renewable energy. The demand growth of energy is about 7%, compare to developing country only 2 – 3%. This study aims to develop renewable energy policy models concerning biomass for rural electrification; to identify factors that influence price of feed in tariff determination, in particular wood-based biomass, and designing the role of social forest as raw materials for bio-pellet industry in sustainable supply chain. Research method using soft systems methodology is the application of Interpretative Structural Modeling (ISM) and Strategic Assumption Surfacing and Testing (SAST). The results showed that key elements of development policy model are feasible biomass energy tariff, competent human resources, coordination among related local government offices and community participation. Other important factors are funds and investment for business, microfinance, state owned forest lands, and smallholder plantations policy one spatial regions plan institutions. The strategic assumptions have been identified, which is sufficient supply of raw materials industry, availability of alternative potential industrial biomass raw materials in the local, the obvious trade system to accelerate the model implementations, that requires regulatory support from local governments, inventory land use and forest area inventory, and support of community leaders.*

KEYWORDS: Feed In Tariff, Social Forest, Interpretative Structural Modeling, Sast, Bio-Pellet Industry

INTRODUCTION

Indonesia as one of the oil producing countries has a high export potential, but unfortunately is currently a net importer. Fuel consumption is about 1.4 million barrels of oil per day (BOPD), while production is about 940 thousand BOPD. Imbalance of supply and demand has resulted in enormous imports. Subsidies for fuel and electricity are very large over USD 300 trillion and conditions of fluctuating oil prices reached $ 140 per barrel resulting in a very heavy burden on the government. Development of alternative energy from new and renewable energy is a solution to reduce dependency on imported oil. Development of alternative energy, in accordance with the Presidential Decree. No.5 year 2006, mandated that energy mix to renewable energy by 17 percent by 2025. Implementation of this policy through Minister of Energy and Mineral Resources

Regulation No. 4 in 2012 specifically regard to biomass Feed in Tariff, and number 19 year 2013 for waste products FIT. The revision to complement and reinforce the development of new and renewable energy, requires policies that regulates the feed-in tariff for bio-pellet. The role of government is very important to encourage development of technology, incentives system, feed-in tariff, and ease of licenses, fair competition with domestic industry alignments and to facilitate related variety of research and development. In addition, the private sector should also contribute by improving raw materials to the biomass industry through optimizing Corporate Social Responsibility for community development as part of the entire supply chain system. This is in accordance with the provisions of Law no. 40 year 2007 on Private Companies that exploitation of natural resources are require to implement CSR for Community Development.

The development of biomass-based renewable energy needs continuity of feedstock. It is strongly associated with land use and social conditions, related to community empowerment. Raw materials continuity can be supplied from forest harvest, both public forests and forest plantations. In this context, the development is directed to areas that have potency for widespread cultivated forest. One of them is the Sumbawa Island, located relatively close to the island of Java, manages natural resource industries, for their own use and yet has investment opportunity. Lodging in West Sumbawa regency, based on the results of the study identified the potency of local economic development community forest development, potentially to the industrial biomass growth as a renewable energy feedstock. In general, West Nusa Tenggara District is also potential for the development of the biomass industry due to availability of sufficient land which could be utilized as energy plantation area. The gold mining company existence could be one of driven factors of energy plantation development and reforestation on mine locations. Utilization of biomass, directly as firewood and charcoal for locals cooking purposes not included in the utilization of renewable energy. As for which is included in the utilization of renewable energy is for electricity generation through biomass gasification process. Under these circumstances the research aims are: (1) identifying factors that influence development of renewable biomass energy policy, based on forest biomass managed by people (2) designing bio-pellet industry supply chain system with sustainable empowerment of community forests, and (3) developing renewable energy policy of biomass based industry, for rural electrification.

RESEARCH AND METHODS

The study was conducted with the soft system methodology (SSM) through seven stages , namely : (1) identification of problems facing the situation (2) express the problem statements in form of rich picture (3) develop root definition in accordance with purposeful activity system (4) designing the conceptual model based on the root system definition (5) comparing conceptual model of the problem situation (6) Discussion of desired changes and (7) remedial action as a solution (Checkland 1981; Jackson 2003) . This approach is attempted to understand the problems that are complex and dynamic. Jackson (2003) stated conceptually to achieve the objectives of complex situations will not be effective if done with approaches that are both pragmatic and mechanistic. Thus these are need for structured assessment and goal-oriented achievement.

Stages of the research conducted are literature review, expert surveys and focus group discussions (FGD). Focus group discussions carried out to bring the strategic assumptions with Strategic

methods Assumption Surfacing and Testing (SAST) and expert surveys by method of Interpretive Structural Modeling (ISM) (Saxena, 1992). The ISM method is to determine key elements, hierarchical structure and identify the characteristics of the sub-element based on the level of dependency and power driver. Related systems approach to problem solving is done through the system analysis and engineering policy. The method, analyzing the system done by six stages such as (1) analysis, (2) problem formulation, (3) identification system, (4) alternative solutions establishment, (5) determination of the realization, and (6) validation.

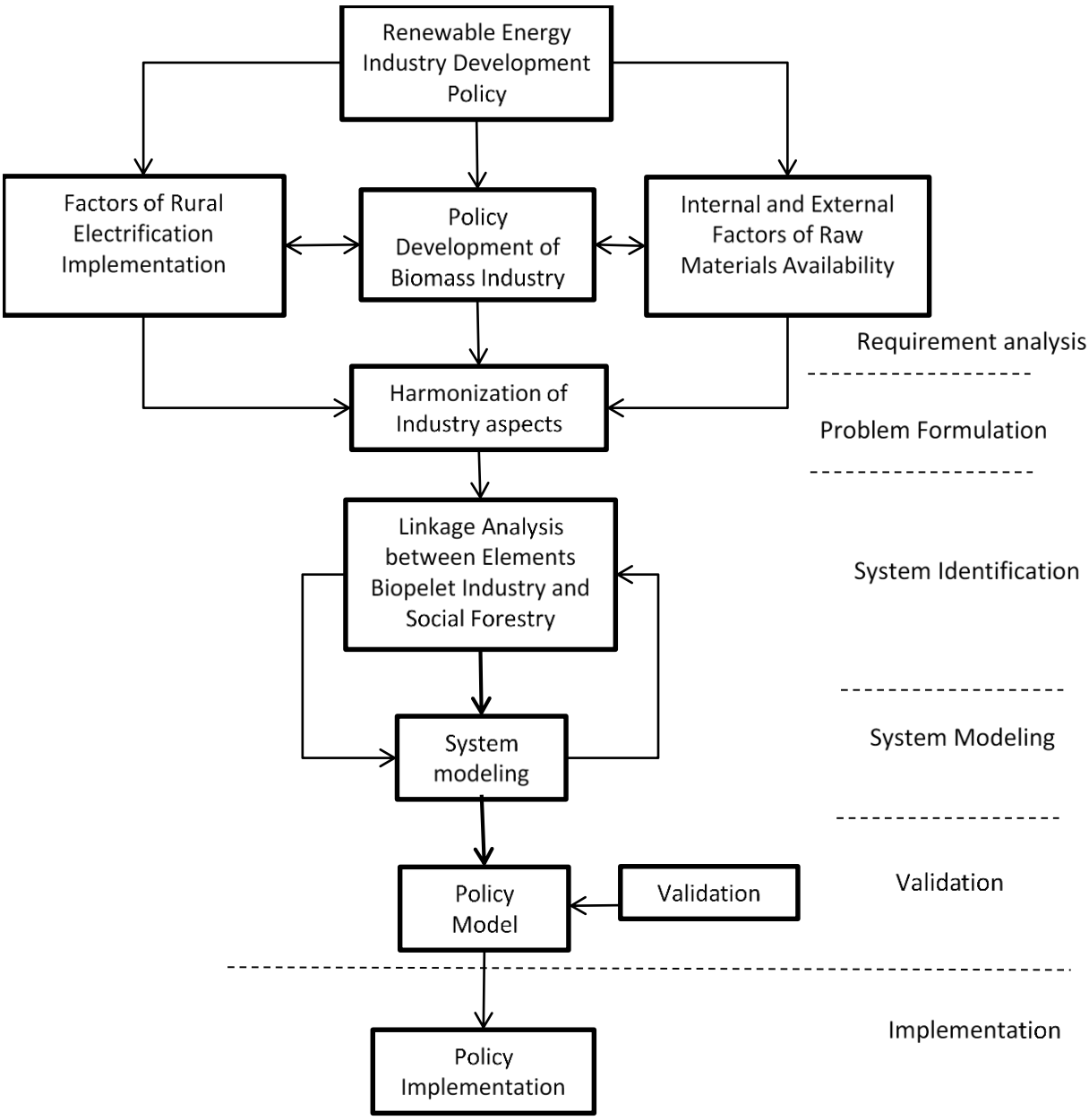

Figure 1 Research Frame work

RESULTS AND DISCUSSION

Renewable energy policy for the industrial private forest-based biomass has an input controlled or not controlled. Uncontrolled inputs include land use, land use rights, the exchange rate, the price of the product and the market demand. Controlled inputs include appropriate technology, human resources quality, supporting infrastructure, access to finance, supply chain systems and socialization. Input controlled and uncontrolled inputs along with the input environment (legislation, government regulation, public culture and agro-climate) produce the desired output in the form of job creation, the utilization of forest products that are environmentally friendly, Green SME growth, availability of renewable energy, and Empowerment people and viable biomass energy rates. In addition to produce the desired output, the output is also obtained in the form of unwanted output: serviceability degradation, deforestation, high production costs and low public participation. This undesirable outputs into a feedback to management control and then the controlled input and renewable energy policy for the social forestry -based biomass industry will produce output that controllable. Figure input output system is shown in Figure 1.

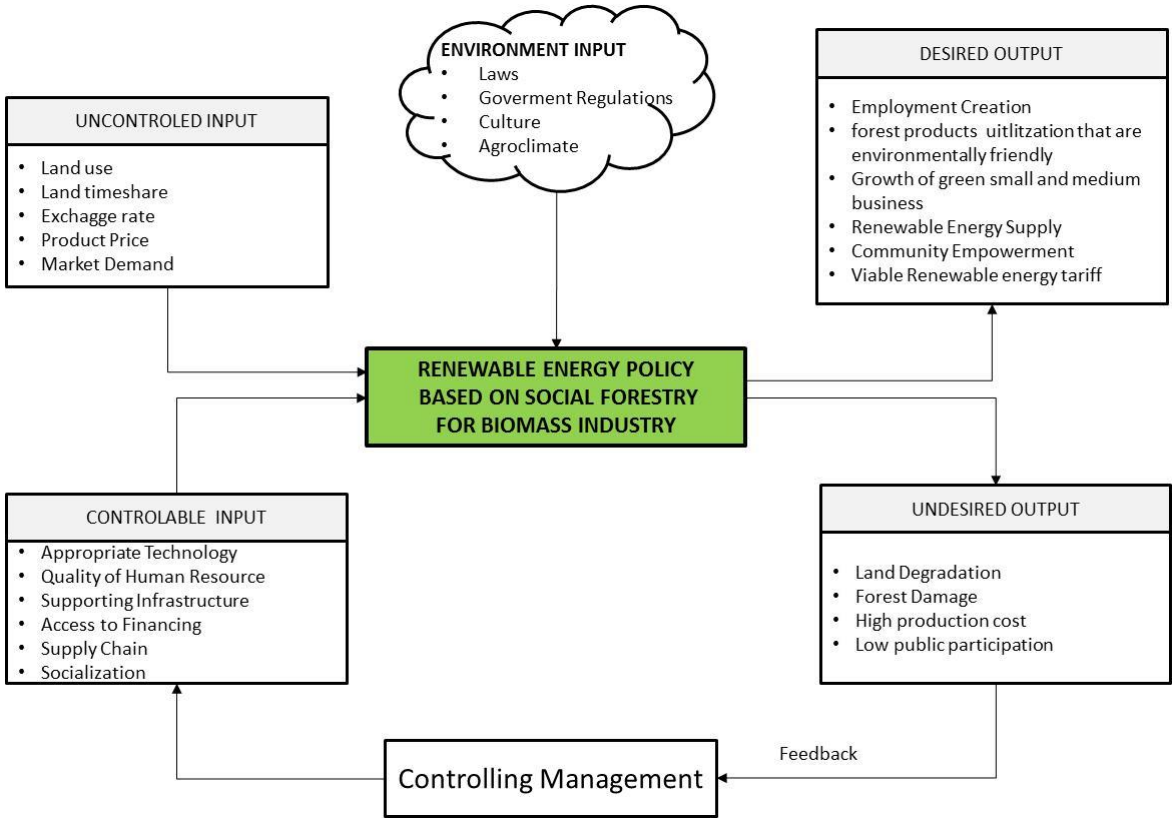

Figure 2 Input Output System

CONTRIBUTIONS TO KNOWLEDGE AND PREVIOUS RESEARCH

Biomass is a renewable energy source that is important and will continue to be developed in the world. The development is now seen one of them in China that the development of biomass is very high, ie 3,511 MTCE (million tons of coal equivalent). Biomass highly distributed in China depends on the geography and climate in various provinces where development is still very necessary policies, and Feed -in Tariff incentives and subsidies for capital goods and research and development expenses also include tax incentives and pricing. Geographical distribution of biomass in China is unbalanced depending on the provinces of Sichuan, Yunnan and Tibet which is 33.3 % of the total distribution in China. Biomass and conventional energy products are complementary from one province to another province. Large biomass potential is in Tibet, Heilongjiang, Henan, Shandong, Hebei and Jilin. Biomass energy side distributed varies from province to province in China which is the biggest 14.17 tee (tons of energy equivalent) per capita in Tibet and the smallest is 12.15 tee in Sechiang (Shen , 2010) . Feed -in Tariff Policy in America is still not feasible. Based on the data and the literature in a variety of studies, Feed -in Tariff for solar energy is still not right, still depends on the type of technology that should be further elaborated. The number of restrictions up to 20 MW which inhibits felt incentivized because in Germany there are no restrictions on the amount of capacity (size of the power plant). This restriction makes Feed -in Tariffs in America do not support the development of renewable energy. In Germany conducted a policy review of Feed -in Tariff once every 4 years, whereas in America every 2 years (Russell, 2009). Highly developed countries about security and availability of energy very concerned about the development of new and renewable energy , for example the Netherlands has a minimum target of 10 % renewable energy needs to wear in 2020 , the year 2006 has been 5 % (Sadirsan, 2006).

Economic factors - the most influential business is the ability to produce a wide variety of products and sequential or (sequential system) that is able to provide economic security for farm households , reliability and development of product trade system , and the use of relatively low capital inputs caused by sequential application of the system . The success of the development program of community forest management system requires a variety of things: the availability of infrastructure, development of agro-industries, government policy support in the form of capital, ease of bureaucracy, political stability and monetary, trade system is secure and robust land use (Vitello, 2001). Response of the stakeholders is crucial to the success of the social forestry program. Implementation of social forestry goes well when there is a positive response from policy implementers in the field, both on the part of local governments and communities to achieve targets.

Conceptual Model social forestry policy was built from complexity analysis of the problems faced in order to realize the sustainable success of the program. The main problem in the social forestry program consists of three parts: (a) planning synchronizing issues between the central and regional and inter- related sectors. Therefore formulated social forestry Management Model which is the integration of development plans in order to achieve the desired objectives, namely an increase in the productivity of degraded forest land, increasing the capacity of farmer groups and improving the welfare of society, (b) inter-agency coordination for problem solving through Model social forestry Institutions business . These models explain the working relationships between agencies

involved in handling the social forestry, (c) The problem of funding developed through the Funding Model social forestry shows funding alternatives i.e. a revolving loan fund of BLU P2H Center , the development of partnerships with large industrial / medium , and utilize funds CSR (Corporate Social Responsibility), and the allocation of the development budget of the local government .

Implications of the model is the establishment of institutions social forestry policy coordination at the district level in the form of the Working Group which is a representation of the various parties associated with the administration of the social forestry . Working Group provides guidance policy strategies into the work program of each party. The vision of Working Group is the coordinating agency for realizing business continuity plantations run by the community . The Working Group also became the center of mentoring activities undertaken by scholars forestry .

The use of ISM method to analyze the factors that affect the implementation of renewable energy has been done by Eswarlal (2011) in India . Based on previous studies, Eswarlal identified 14 key variables that affect the implementation of renewable energy . These variables not only affect the performance of renewable energy development , but also influence each other.The 14 variables are as follows : (1) Leadership; (2) Strategic planning; (3) Availability of technology; (4) Public awareness; (5) Top management support; (6) Sustainable growth; (7) Return on investment; (8) Availability of finance; (9) Skilled man power; (10) Government support; (11) Availability of the data and information; (12) Availability of energy resources; (13) Support from interested groups; (14) Efficiency of process and execution.

Based on the analysis of the ISM, the 14th hierarchy shown in Figure below. Pictures of the model based on the ISM shows an overall view issues in the implementation of renewable energy for policy makers. Here identified the variables that affect the performance of the process and the relationship between these variables. This model works for better managerial decisions in order to succeed renewable energy projects more effectively and efficiently. This model also works to identify the variables of leadership, strategic planning, public awareness, top management support, availability of finance, government support, and support from interest groups (stakeholders) as a very important factor that requires high attention and immediately from policy makers.

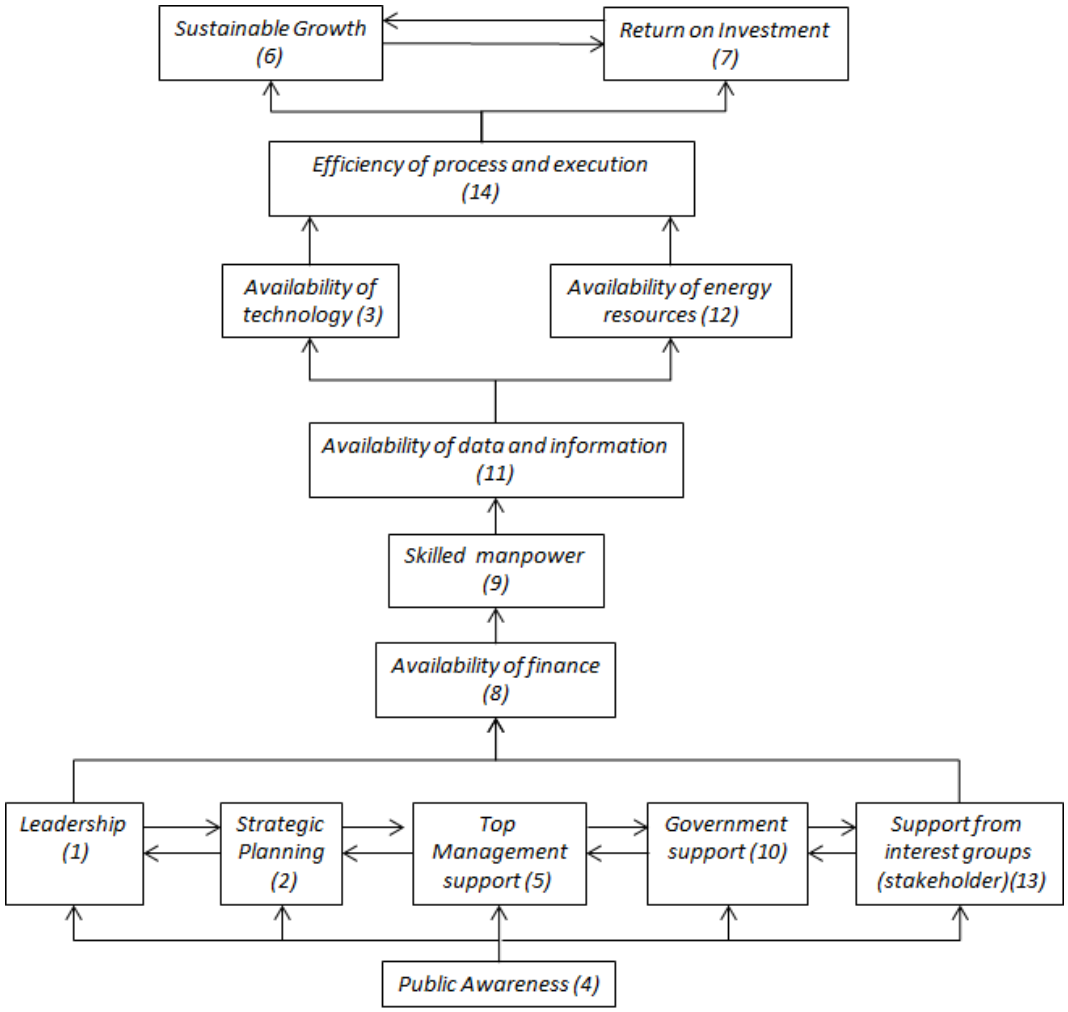

Figure 3. Model Based on ISM

From the picture above , it appears that public awareness (variable 4) of the renewable energy is a very important variable that has the highest driving power and dependence power zero. This means that these variables are highly significant and direct all other variables. Therefore, policy makers should focus more on public awareness to implement renewable energy for the success of sustainable development. Public awareness of the Renewable Energy will lead to the support of top management (variable 5) . In contrast , the quality of leadership (variable 1) of the manager can function only if there is support from top management . Strategic planning (variable 2), which requires good leadership qualities of managers and supported by top management . The support of interest groups (variable 13) can not be realized if there is no support of top management. The availability of finance can be ensured with the support of interest groups. Skilled labor (variable 9) and the availability of data and information (variable 11) is very important for the successful implementation of renewable energy projects. The availability of finance actually helps provide skilled labor for skilled workers is high cost. The availability of information (variable 11) ensure effective utilization of resources. Inconsistency of data and information will lead to a lack of public interest and management that will ultimately lead to

a lack of energy resources (variable 12) and the lack of technologies for renewable energy (variable 3). Outdated technology gives a direct effect on the efficiency of the process and its execution (variable 4). So that more funds should be invested in the development of new technologies for the successful implementation of renewable energy projects . High- efficiency process that will lead to sustainable growth (variable 6) that would cause the return on investment (variable 7), or vice versa . Good return on investment is the symbol of sustainable economic system

Table 1. Results of Previous Research

Author	Knowledge
Feed in Tariff	
Ikeda J. 2013, Jepang	This study focuses on the Feed-in Tariff in Japan where renewable energy generation facilities must be certified by the Minister. This study shows alignments Japanese government with business community to promote Renewable Energy for solar energyr. FIT programms are very supportive in developing renewable energy in Japan.
International Financial Law Review. 2012, Philippines	the Philippines in the Philippines Renewable Energy Agency (ERC) adopted a lower rate of return of 16.44% internal equity, except for biomass by 17% to reduce the risk of fuel. Imposition of tariffs fell by ERC. The rate of decline was recommended by NREB is 6%. Rate. This research associated with the expected IRR.
The Financial Express, 2013, Bangladesh	To increase the share of renewable energy to 10% by the year 2020 so The Government of Bangladesh made a policy of mechanism for accelerating investment in the renewable energy sector by offering long-term contracts to renewable energy producers, based on the cost of generation of each technology. This study shows the pattern of policy implementation in Bangladesh is very structured and use as a pattern of escalating Cooperative Rural electrification. IPP implemented by the Cooperative and funded by the World Bank.
Economic & Business Week, 2010, Prancis	France In order to improve the development of the biomass industry tariff rates by approximately 50% to create a cost effective and competitive compared with fossil fuel market. This study shows that France with nearly 100% use as a nuclear power plant is operationally very cheap and the Government compensation for biomass energy mix in order to perform quickly. Lustig, et al. 2013, Nova Scotia study explores an ambitious Government targets to achieve 40% of electricity supply from renewable energy in 2020 applied a fixed payment (fixed price) per - kilowatt - hour electricity output of the project to small businesses.
Lustig, et al. 2013, Nova Scotia	Scotia's study explores an ambitious Government targets to achieve 40% of electricity supply from renewable energy in 2020 applied a fixed payment (fixed price) per - kilowatt - hour electricity output of the project to small businesses.
Economics Week. 2012. North America	The North American study examines the important changes to the FIT program: People were given the chance to develop and have a renewable energy project, thus lowering the FIT rates mean cheaper renewable energy for everyone.

Craig Froome, 2009 Australia	Australia target mixed is 20% in 2020 from Renewable Energy. The Australian study concluded the use of biomass fuels and biomass generators will provide additional short-term solution, the study showed that the co - firing coal with biomass (5-10 per cent) can provide emissions savings equivalent to the content of the biomass.
Varriale, 2013 Middle East	Middle East government directly pay most of the tariff as a substitute feed in tariff or equivalent incentives. Research in the area and the country is rich in oil, make a breakthrough use of renewable energy by ignoring the common steps performed, so it created a special fund to promote renewable energy use. Governmental institutions of the European continent are using these funds to work on the construction of power plants with renewable energy.
Niall et al, 2013. Ireland	Niall et al, 2013. This study compares the Irish fare structure / FIT design sensitivity to market prices with specification error kasusdi Irish studies. Ireland has a large fossil energy sources, but highly encouraged renewable energy and attention.
Johnston, 2012. Japan	Japan Biomass Rates set for 20 years and are classified into biogas from sewage sludge, sludge itself (which burned), forest thinning, the entire timber and recycled wood for biomass made from forest thinning: Y33.60/kwh. Rates for woody biomass intact: Y25.20/kwh and biomass made from recycled wood, which often comes from construction projects Y13.65/kwh. This research provides the additional knowledge that the biomass in the industrialized country like Japan, remains a major concern and is managed professionally.
Danescu et al, 2011. Rumania	Danescu et al, 2011. Romania's National Energy Research explore the Medium-Term Strategy with three primary objectives: to prepare the energy sector finance, start the process of privatization in the distribution and subsequently electricity production sector, and ensuring a functional and sustainable development in the medium term to stimulate new investment in energy sector.
Johnstone et al, 2010	Johnstone et al, 2010 This paper examines the effect of environmental policies on technological innovation in the particular case of renewable energy: (1) Public policy plays an important role in determining patent applications. (2) Different types of effective policy instruments for different renewable energy sources, (3) more targeted subsidies, such as feed-in tariffs, necessary to encourage innovation in energy technologies are more expensive.
Social forestry	
Merkle et al, 2011. United States	At the University of Georgia conducted experiments to evaluate the hybrid sweetgum and American chestnut wood for biopellets production, which in turn can be used to generate electricity through cofiring with coal or gasification. Di University of Georgia dilakukan percobaan untuk mengevaluasi sweetgum hibrida dan kayu kastanye Amerika untuk produksi biopellets , yang pada gilirannya dapat digunakan untuk menghasilkan listrik melalui cofiring dengan batu bara atau gasifikasi .
Ravindranath. India	This study analyzes the Indian scenario of sustainable forestry biomass which is intended to meet the demand to stop deforestation and regeneration

	of degraded forests.these are developed and analyzed for mitigation and cost effectiveness in India.
Smeets et al. 2007	Biomass wood from forests, plantations, trees outside forests, and logging and wood processing residues can be a major source of bioenergy in 2050, up 8.5 GM3 (98 EJ). Changes in wood processing technologies and industrial estates can improve global bioenergy potential.
Weih, 2004. Canada	The main obstacle to the rapid development of Short Rotation Forestry (SRF), particularly in the areas of agriculture, it is not from climate, technical or environmental constraints, but more to the social and political issues, such as agriculture and energy policy, market development, public attitudes.
Danesh Miah et al, 2011. Bangladesh	CDM project base on biomass and bioenergy support sustainable development in Bangladesh. Need capacity building and policy changes in order to meet the CDM modalities.
Demchik, 2009. Minnesota	Cost of harvesting biomass is influenced by the condition of the location, distance, number of units harvested with one machine, the number of machines being transported, acres harvested, and the inclusion of logs.
Guo Zhimei et al, 2011. Tennessee	This study uses a model of Tennessee Timber Supply Sub - regional to analyze potential biomass feedstock aggregate forest area and an additional impact on the demand for pulpwood logs regional markets through 2030. Projection results indicate that there is an adequate supply of wood pulp to 50 million gallons a biorefinery facility in Tennessee. More feasible to increase the use of wood pulp wood for renewable energy than softwood pulpwood. Chain.
Skog Kenneth et al, 1997. United State	Kenneth Skog et al, 1997. United State study aims to expand the use of woody biomass to generate electricity or ethanol with improvements in technology, increasing the comparative advantage of wood biomass feedstock relative to fossil fuel feedstock.
Supply Chain	
Stone et al, 2011	Results of case studies show that the market access and price, the cost of innovation, the effects on the quality of the final site, and support innovations from outside the company is the biggest factor affecting crop biomass.
Klein, 2011	Studies related logistical issues to produce biomass energy.
Morgan, 2009. Montana	Montana woody biomass material from living trees and standing dead trees, logging residue, mill residue. This can be done through improved maintenance of forest restoration, fire hazard reduction, commercial timber harvest, salvage logging, and precommercial
Svanberg, 2013	Framework that can inform decision-makers in the supply chain of biomass energy, especially in the torrefaction plant, the upstream and downstream implications. The findings have implications for biomass energy chains and provide a perspective of supply chain torrefaction pre-treatment process .
Jappinen, 2011. Finland	This study presents two case studies of forest biomass supply 100 GWh. This study evaluated the effects of local biomass availability and nature of the road network on greenhouse gas emissions (GHG). The results highlight the fact that local conditions must always be taken into account when menila

	sustainability of biomass-based energy production.
Bedarul et al, 2012. Northwestern Ontario	The Biomass analyzes the impact of competition on the cost structure and gross margins show: cost minimization model shows that the procurement cost per unit is directly proportional to the size of the power plant in all scenarios. This study emphasize the important of feedstock in Biomass industry.
Galik, 2009. Southeastern United States	Southeastern United States regional biomass supply is a function of current harvest levels, the current log price, and the price elasticity of supply of logs. Each of these factors varies according to region and from time to time.
Wuyuan Peng, 2006. China	After 2002, rural electrical systems combined with the urban system, establish a national integrated system of administrative electricity in China.
Omer, 2012	Biomass technologies should be encouraged, promoted, investment, and carried especially in the remote rural areas.
Erin, 2007. Canada	Canada Transportation costs for biomass and its products have fixed components regardless of mileage and distance components of variables that are directly related to the distance traveled. These two factors should be included in the analysis of transportation costs.
Abbas et al, 2013. Michigan	Dinamika Michigan market dynamics will definitely play a major role in determining whether sustainable biomass can be supplied to the consuming industry.
Dogl et al, 2012. India dan China	India and China models diamond Porter modified and assigned to the renewable energy industry. Design / methodology / approach - Based on Porter's diamond model of competitiveness, examined the demand for renewable energy in India and China and the German company's ability to meet this demand.
Karhunen et al, 2012. Finland	The aim of this study is to introduce a systematic method to analyze the availability and demand for forest biomass. This study introduces an objective method for analyzing local possibilities of where and how much the use of forest biomass can be improved.
Ranta, Tapio, 2012. Finlandia	Finnish biomass supply fee average is 17 [euro] / MWh for the annual supply of 2 TWh of forest biomass. One finding is that the greater the need for biomass, the lack of variation in biomass availability and supply costs, as almost the entire country will serve as regional supply potential.

The studies above are regional, highlight the role of government in each country to encourage the use of biomass and reduce the greenhouse effect and achieve the target energy mix in some countries. My research positions related to the supply chain system, economy and empowerment of local policies because Indonesia is unique and strategic policy is relatively complete, but its operational implementation requires the support of various parties in order to be implemented. Characteristic of developing countries is very strong community participation and fragmented bureaucracy, are expected to study the gap between strategic policy and operational policy can be harmonious and mutually supportive. My research contributions to knowledge are : giving incentives, i.e. ease of licensing, feed in tariff, mandates energy mix as previous studies in various

countries, will not give a big boost to the advancement of renewable energy use in Indonesia if it is not supported by proper model of supply chain by utilizing social forest.

The identification of development of renewable energy problems is described in Rich picture diagram (Figure 3), which are three main issues : (1) land status, (2) environmental degradation and feed in tariff. These three main issues became the basis of goal-oriented activity , resulting *root definition* model : " designing policy of supply chain system of biomass industrial as a source of renewable energy based on bio-pellets through the development of bio-pellets which viable economical, insightful environment, involving the business, people and government efforts to achieve sustainability business, community development and rural electrification to support national energy security " .

To achieve the goal, activities model or purposeful activity model was structured .Objective conditions suggests that investment financing for energy industry preceeded the existence of PPA (Purchase Power Agreement) . With the investment activities, energy gardens can be developed which supply bio-pellet industrial raw materials, as a source of energy for rural electrification power plant. It drives the economy in the region and in the long run will strengthen the availability of renewable energy. The overall activities of goal-oriented system were conducted by indicators of sustainability efforts, energy mix, and the electrification ratio.

Table 2. Key Elements of Renewable Energy Development based on bio-pellet

Key Elemen	Sub Key Elemen	Dependency
1. Program goals	Determination of energy tariffs	Increasing public welfare
2. The needs of the program	The competency of human resources Coordination between Local Government Offices-related Community participation Funds & investment banking business Microfinance	Raw materials industry
3. The public sector	Public figures	Electric Consumers
4. The main constraint	Status of forestry land Policy social forestry	Investments business high technology Limitations of regional infrastructure (d) The level of skill and knowledge of HR
5. possibilities changes	Urban Planning, Land Use Planning	Increasing SMEs Entrepreneurship and work ethic Value-added management social forestry

Key Elemen	Sub Key Elemen	Dependency
		Conversion of energy sources from fossil
		The availability of electricity in rural
		Feasibility and optimization of industrial land use
6. The institution concerned	The financial institution / bank NGO Professional associations energy field	Private companies / energy industry The local government

Structure Model Development

Based on the expert opinion there are six elements of the development program for the renewable energy policy model for biomass industry : (1) program goals, (2) the needs of the program, (3) the public sector, (4) the main constraint, (5) possibilities changes and, (6) the institution concerned. By using ISM analysis, obtained *driver power-dependence* matrix, which shows the key elements of each element as presented in Table 2. From each element of programs, it was identified sub elements keys, namely the sub element of program goals is the determination of the energy tariff. This shows that the purpose of the energy rate determination is independent variables in the energy policy system and as driving force to the higher level program but small dependency to small program. In the context of bio-pellet industry, the economically viable feed in tariff contributes the achievement of social forestry empowerment and social welfare improvement.

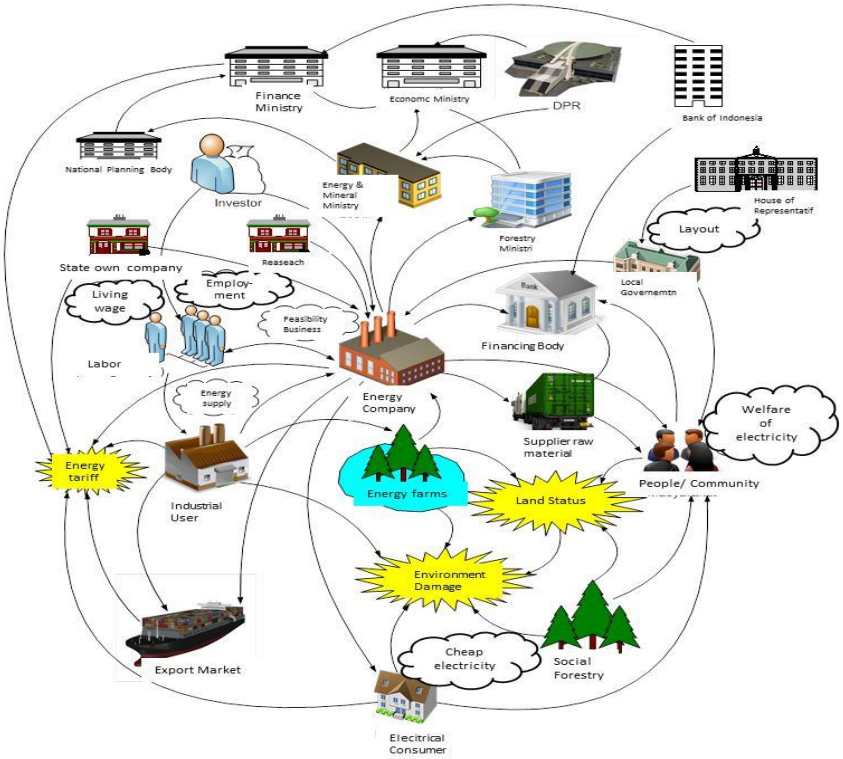

Figure 4. Rich Picture

Assumptions Strategic Development Model

The basic assumptions of the renewable energy policy development model for sustainable biomass industry were obtained from Focus Group Discussion (FGD). The results of these discussions led to 27 assumptions which grouped in three aspects: environmental, social, and economic. The assessment from expert based on level of importance and level of certainty identification drives to strategic assumption as shown on Figure 5. Strategic assumptions are in quadrant II, which has a level of importance and high certainty. The assumptions of the environmental aspects : sufficient supply of raw materials, availability of potential alternative industrial biomass raw materials in local, decreasing environmental damage, land and forest inventory, as well as agro-climatic suitability.

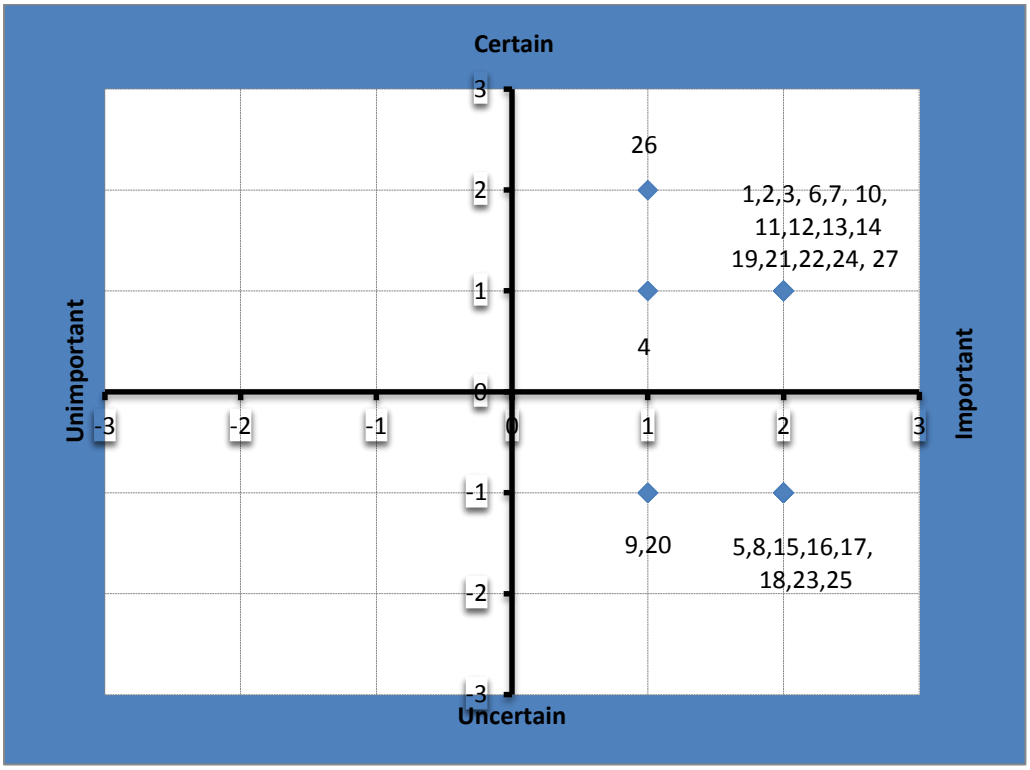

Figure 5. SAST Quadran Assumption

Strategic assumptions for social aspects are: support from community leaders, people involved and supporting the program implementation, support regulatory (licensing) and local governments, as well as well-distributed information and dissemination of biomass. The strategic assumptions for economic aspect are : can be used as a new energy source for local, Investors seriousness and commitment, support investment regulation , increased income, the existence of a clear trade system, and there is market potential for both local and export (underwriting market).

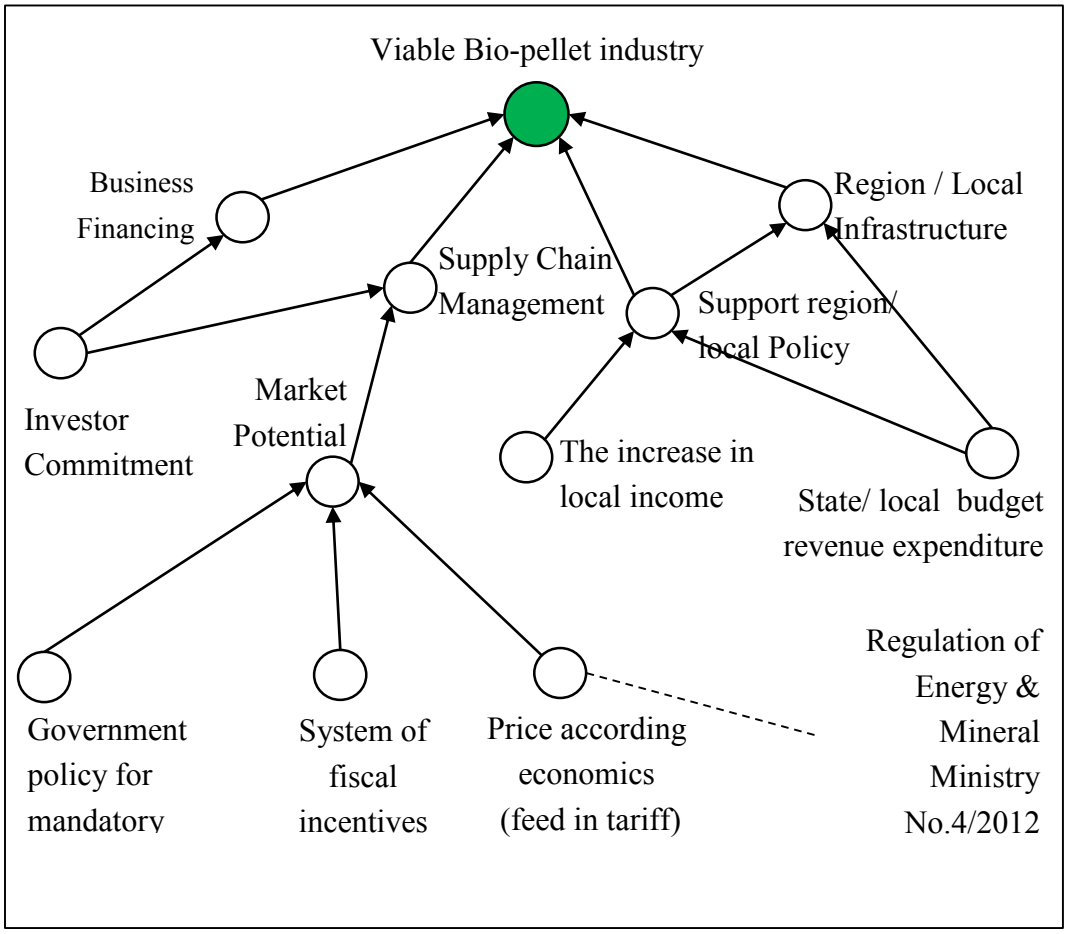

Figure 6. IOM Viable Bio-pellet Industry

Intermediate Objective Map

Key elements of the program and the resulting strategic assumptions are used as *intermediate objectives map* as a connection the ultimate goal of the policy model. Map objectives are expressed as claims, i.e. claims of : (1) Forest resources preservation, (2) Energy forests development, (3) Bio-pellet industry as green business, (4) Viable Bio-pellet industry, and (5) Bio-pellet industry provider for rural electrification. Renewable energy policy for rural electrification is strongly associated with the industrial feasibility of energy generation feedstock providers. Therefore supply chain management is required which is supported by business financing, regional infrastructure and regional policy. This is based on the existence of appropriate economical energy prices, fiscal incentives system and government policy for mandatory, this claim as shown on Figure 6. Based on this approach, two models were developed : (1) The model of Bio-pellet industry investments for electrification (Figure 7) and the model of supply chain as well as the empowerment of social forestry (Figure 8).

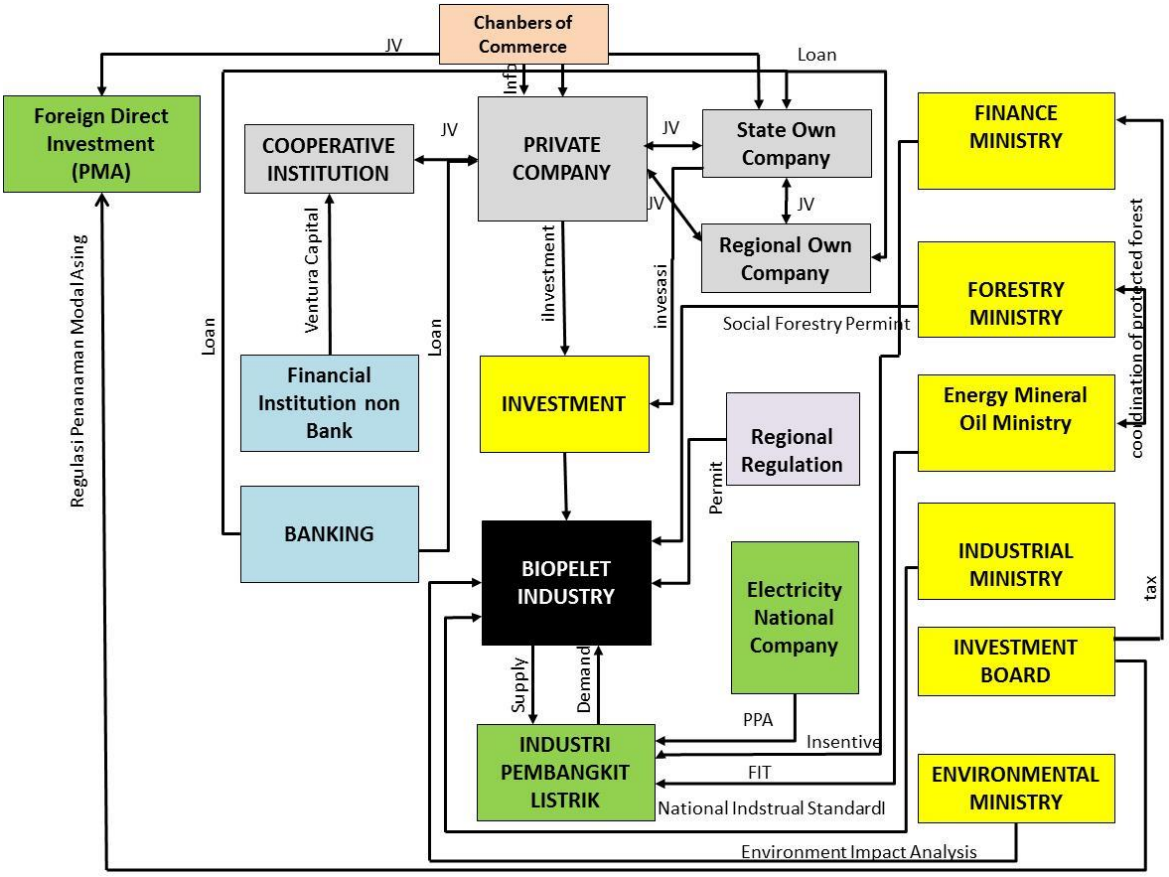

Figure 7. Model of Bio-pellet industry investment

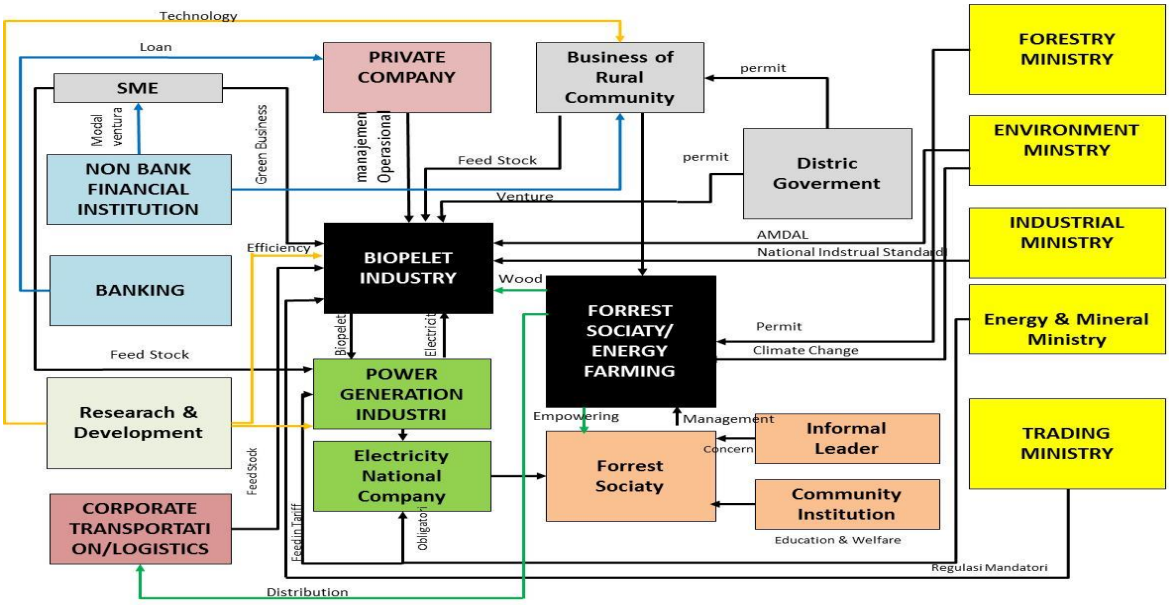

Figure 8. Model of Supply chain and empowerment of Social forestry

IMPLICATION

Policy implications of these two models are prioritized in three 3 aspects, (1) Supply chain system for Bio-pellet industry, (2) a feed-in tariff, and (3) the empowerment of social forestry. In the aspect of supply chain systems for bio-pellet industry, it is required integration of energy policy across sectors, i.e. electrification, forestry and empowerment that are environmentally friendly. It's also mandatory requirement that users of fossil fuels has obligations to consume biomass to generate electricity. In order to establish continuity of the bio-pellet raw materials, it requires support of bio-pellet adaptive technology, so the role of research institutions as well as to create effective innovations is needed.

Economic aspects associated feed in tariff is necessary to establish the type of renewable energy and biomass specifications. Governments also need to set incentives for bio-pellet industry, which will greatly affect the economics of bio-pellet product :

- Support from the Government to access funding
- Joint Decree of the Ministry of Industry, Ministry of Energy and Mineral Resources, and the Ministry of Finance.
- The government needs to provide a fixed price feed-in tariff and evaluated periodically to encourage the private sector to develop biomass-based renewable energy (bio-pellet base).

Sustainability industries based on natural resources cannot be separated from the existing businesses in the community, so that the community empowerment strategies are needed, particularly among the social forestry.. This effort must be done in an integrated manner with the involvement of public, private, government and other stakeholders. Strategic steps that need to be done, such as:

- Ministry of Forestry issuing a regulation that requires minimum of 20% public forests is for energy plantation
- Proactive local government to educate people on energy plantation and management of raw materials for biomass and bio-pellet.
- The licensing of bio-pellet industry will issued if the private sector has a Memorandum of Understanding with community agencies to manage public forests.
- Mandatory use of local is prioritized for at least 50 % of the bio-pellet production.

POLICY IMPLICATIONS

The policy implication is a logical consequence of the establishment of a policy . Similarly, in the context of this study has been to formulate a model of renewable energy policy based smallholder plantations for sustainable biomass industry bear the consequences of something that should be done so that the model can work effectively formulated . The policy implication of this research can be divided into three (3) sections :

1. supply chain bio-pellet,
2. Determination of the feed in tariff and
3. The empowerment of smallholder plantations .

Supply Chain Biopelet

Implementation of Supply Chain Model Biopelet can run more effectively if supported by an integrated policy between energy policy, energy and forestry as the mandatory use of energy as a mixer bio-pellet steam power plants, in this case derived from coal. The creation of markets requires attention, is associated with Presidential Decree Number 5 of 2006 on National Energy Policy, including biofuels to 5 % in 2025. There should be mandatory that the user requires coal fuel mix for power generation with biomass or bio-pellet. The creation of this market will drive the industry bio-pellet various areas that have great potential for social forestry as well as in West Sumbawa regency. Using bio-pellet mandatory policy is a product of the policies issued by the Minister of Energy and Mineral Resources. In countries such as Korea and Japan are required to use a mixture of 20% bio-pellet of coal fuel requirements for electricity generation. Biomass energy is energy that has potential, but is hampered by logistical problems. Study of logistic problems will help solve the problem of supply chain and make biomass as a reliable source for energy and economic development (Klein , 2011). Need to set energy policy that is sustainable forest and do not damage the environment and this needs to be regulated in the Decree of the Minister of Forestry along with the Minister of Energy and Mineral Resources. In terms of the process is the role of technology. In countries such as India, the UK and China, the development and use of technology handed over to the private sector, but in Brazil handled by the government. Biopelet technology related policy development in Indonesia seek a mix of both. Research institutions, such as BBPT and LIPI and academia need to do research and create innovations regarding appropriate technology to process bio-pellet. In the state of China, made a model of the supply chain from the landing to the biorefinery, including biomass harvesting, transportation, and storage . Supply chain model is evaluated using several criteria which include the cost of raw materials, energy consumption, and greenhouse gas (GHG) (Zhang et al , 2011). China's policy framework has matured and evolved since 2005 on Renewable Energy regulation, these regulations were updated in 2009. In 2020 renewable energy target of China is similar to the European Union. However, China continues to face many challenges in the development of technologies, networks - integration, and policy frameworks. This includes training, research and development, operating experience and performance of wind turbines, transmission constraints, time lags in the area of network interconnection, resource assessment, integration of the power grid on a large scale, and further policy development and adjustment (Martinot , 2010). The process of substitution is of course the use of energy should be coupled with innovative equipment and industrial machines that can support the use of alternative energy and to minimize the negative effects of the use of alternative energy (Hidayat , 2005). Biopelet industry is quite profitable with BEP 3.6 years, an investment of Euro 193,600 for a plant capacity of 7.5 tons per hour (Smart , 2009).

Operational policy implications of supply chain bio-pellet is as follows : (1) Ministry should issue the permit the use of Community Forests in a short time , eg within 3 months, (2) Local government to issue land use planning and allocation system for bioenergy area clear and structured, (3) Non-bank financial institutions to finance the venture capital schemes cooperative with a clear, ready Banking credit to the private sector for bioenergy. (4) state own electricity company can obtain legal protection for the purchase of electricity from biomass power plants with economical price.

Determination of Feed -in Tariff

Biomass -based electricity production can be distributed through existing networks, according ESDM No . 4 of 2012 on Power Purchase price of state own electricity company power plants that use renewable energy small and medium scale or excess electricity. This policy has been detailing the rules about the price of this type of renewable energy , but not specific to biomass. Setting incentives for industry bio-pellet will greatly affect the economics of the product bio-pellet. Besides access to the necessary funding support from the Government, as is the case in Brazil provided low interest for private support in the field of biomass. With the different technology types of incentives are also different, it would require the Joint Decree of the Minister of Industry, Minister of Energy and Mineral Resources and the Minister of Finance on these incentives. In Ireland Feed In Tariff determination by comparing the tariff structure / FIT design sensitivity to market prices specification errors (Niall et al , 2013). In Japan , there needs to be an exhaustive review of the renewable energy technologies that Feed in Tariff rates can actually be accounted for and have the reliability of the technology (Ikeda , 2013). In the UK to promote biomass production industry by forcing electricity through Renewable Energy Obligation, incentives are also given to small-scale power industry through the Feed -in Tariff scheme, namely the purchase of electricity sold to the grid at a certain price guarantee to encourage long-term investment that many target fulfillment energy from renewable energy can be quickly achieved. In Indonesia has set long-term goals, but more importantly is targeting between what is to be achieved at this time because of the long -term goals will not be achieved if the target simply not met them. As with any renewable projects in the UAE government pays most of the direct tariff feed in tariff as a substitute or equivalent incentives (Varriale , 2013). In order to achieve a target between the Government needs to give the Feed -in Tariff is evaluated regularly in order to encourage the private sector to develop biomass -based renewable energy in this case bio-pellet. Co - firing coal with biomass (5-10 percent) (Craig Froome , 2009). Feed -in Tariff will cover production costs, transportation costs, the cost of generation and the cost of raw materials. There needs to be a fixed price per kWh for renewable energy power plants developed by Small and Medium Enterprises (Lustig , 2013). In order to stimulate further private sector participation in developing alternative energy from upstream to downstream, then the government needs to provide convenience, flexibility, and incentives for companies interested in developing alternative energy. Meanwhile, to encourage people to use alternative energy, needs to be disseminated to the public as a whole and intensive (Hidayat 2005). ICCC consider the 5 basic requisite policies to attract more investment Renewable Energy, especially in the electricity sector of biomass : (1) The availability of biomass feedstocks, (2) Eliminate the investment barrier, (3) Providing investment incentives, (4) Conviction of cancellation and (5) Presenting investment opportunities with sufficient information (Panjaitan, 2013). Iteration based on sensitivity analysis is made of Feed -in Tariff and exchange rate U.S. dollar (USD) against the rupiah obtained the results as in the following table :

Table 3. Sensitivity Feed in Tariff

FIT (US$c)	USD RATE (Rph)	IRR	BEP
11	11,643	13.67%	7.5 years
12	11,643	15.32%	7 years
14	11,643	18.45%	6 years
11	10,000	12.76%	8 years
12	10,000	14.46%	7 years
14	10,000	17.66%	6 years

Minimal Feed -in Tariff of 12 cents USD to get an IRR of at least 14 % as required by the state electricity company to be able to obtain a Power Purchase Aggrement, this condition assuming USD interest rate of at least Rp 10,000 / USD. These conditions need to be made government regulation that specifically regulate Feed -in Tariff for bio-pellet. Private companies would be interested in investing as an independent power producer with a magnitude up to 10MWatt , it is not necessary auction (tender). Regulation of the Minister of the Feed -in Tariff is equipped with bio-pellet will complement ESDM number 4 in 2012 and No. 19 of 2013 regarding the Feed -in Tariff for biomass.

Feed -in Tariff policy implications are operational :

1. Revision of Energy and Mineral Resources Mistry RegulationNo.. 4 in 2012 and No. 19 of 2013 by inserting Biopelet in Biomass Policy of FiT.
2. Given at the beginning of the investment subsidy scheme until the BEP , then the purchase price of State Own Electricity Company stagging down .
3. Implements Green Banking by requiring banks with an incentive to fund Green Energy lending rate is 2 % below the Central Bank rate so that companies that do business or cooperatives encourage renewable energy will be easier to access the banking.
4. Government subsidies in the form of feed -in tariff is a fixed price to state own electricity company mandated to ensure revenue IPP and PPA contracts so that banks can calculate the risk factor to fund the IPP .
5. Selected on the grid for the IPP requires certainty of payment of electricity, but if the condition is good ability of an area, it can be done off the grid in accordance with the development of the world that lead to the application of off the grid for renewable energy

Empowerment of Forest Plantation

Implementation of Empowerment Model Forest Plantation can run more effectively if supported by policy Forest Plantation that encourages energy farms . Energy farms is expected to support the Energy Security so that Indonesia can be sovereign in the field of energy in the future. What is the importance of energy security in the Defense so formulated and studied

together energy experts. Private Forest Policies already exist in Indonesia through Regulation no 6 th 2007 Forest Plantation mentioned hereinafter abbreviated social forestry is production forest plantations built by community groups to improve the potency and quality of production by applying silvicultural forest in order to ensure the sustainability of forest resources. There needs to be a policy Plantation Forest Gardens Sustainable energy for Forest Plantation in the community more widely used for making wood as building materials and household equipment, but not as energy paradigm in public yet energy toward the garden , so it needs to be introduced Forest Plantation that is ideal for energy farms that do not damage the environment because it is sustainable and can meet local energy needs. At the University of Georgia conducted experiments to evaluate the hybrid sweetgum and American chestnut wood for biopellets production, which in turn can be used to generate electricity through co -firing with coal (Merkle et al , 2011). In Indonesia needs to be done to local timber . Policy on energy plantation on private forest lands should be regulated by joint decree of the Minister of Forestry and the Minister of Energy and Mineral Resources so that people can take advantage of community forests and sustainable as possible and maintain the environment . In India , sustainable forestry scenario aimed to meet biomass demand halt deforestation and regeneration of degraded forests are developed and analyzed for mitigation and cost effectiveness for India . The implementation of appropriate policies and financial incentives on all wood, sawn timber and firewood can be met through commercial forests , so that government funds can be dedicated to preserving the state -owned forests and meet the needs of biomass (Ravindranath , 2001) . India and China are already doing serious activity for energy crop cultivation . They are faced with the problem of conflict of interest between the needs for food and energy . Utilization of marginal land alone will not suffice their needs . India has 9 Biomass Research Center in agro- climatic zones that examines the different energy crops that can grow rapidly with high yields and short rotation , while for China's rapidly growing economy , a shortage of raw materials filled with raw bana imports from abroad . Indonesia, which has great potential in the field of bio-pellet , should be able to take advantage of the momentum that is happening at home and abroad to develop the necessary policies bio-pellet impartial so that we should not be the object of another country that is the target of energy from another country garden . Education to the Community Energy to plant gardens with trees “Sengon” need to be implemented and profitable enough to BEP 5 years , 32 % IRR and cost of Rp 34 million per ha (Indira , 2009) .

Empowerment policy implications of community forest operations are as follows :

1. Forestry Minister issued Decree is expected to be at least 20 % for gardens Energy Community Forests.
2. Local government should be proactive in order to obtain a Community Group education about gardens and Energy Raw Materials management for biomass.
3. Private Party shall have a MoU with the Institute of Society to manage the Forest Plantation before permit issued Biopelet industry.
4. Mandatory use of local bio-pellet priority for at least 50 % of the production bio-pellet .

CONCLUSIONS AND RECOMMENDATIONS.

Conclusions

1. Based on the ISM of the six elements studied then obtained the factors that influence energy policy based on renewable biomass from social forestry are : (1) the determination of the energy tariff, (2) competent human resources, (3) coordination between the related local government offices, (4) a system of incentives, (5) community participation, (6) funds and investment banking business, (7) microfinance, (8) the need for local governments to design spatial and territories. These factors should involve financial institutions , NGOs and Professional Association
2. Biopelet industry supply chain model with sustainable empowerment of community forests need to be supported by the party : (1) The Central Government which includes the Ministry of Forestry, Ministry of Environment, Ministry of Industry, Ministry of Energy and Mineral Resources and the Ministry of Commerce, (2) Local Government (LG), (3) Financial Institutions, (4) Institute for Research and (5) Private Companies. This system supports the Central Government with the various policies that bio-pellet industrial private forest base by continuing to do business.
3. Renewable energy policy model based biomass industry for rural electrification involving small and medium enterprises are very dependent on funding from non-banking agency is to make a feasibility study as a condition of the issuance of the power purchase agreement by state own electricity company. Access this funding to be important for the next step up rural electrification can be achieved just as described in the Rich Picture.
4. Corresponding structural model developed shows that the independent power producer (IPP) makes driving the growth of green business models for utilization of unused land throughout Indonesia and mined land, according SAST and ISM are portrayed on the results of the model developed by the IPP can only be accomplished when the private sector gets full support from community leaders and civil society to ensure the implementation of sustainable energy farms.
5. The sensitivity of the IRR for Biomass Power Plant produces that FIT is the minimum exchange rate of USD 12 cent with RP / USD at least USD 10,000 to obtain the required minimum IRR of 14% state own electricity company

RECOMMENDATIONS

1. Determine the energy rate bio-pellet eligible to stimulate biomass -based energy industry that is sustainable with fixed price provisions to ensure business certainty approved banks and financial institutions. It advised the Minister of Energy and Mineral Resources Regulation and mandated to state own electricity company.
2. Facilitating access to financial institutions / banks in financing biomass -based energy industry by involving Non-Bank Financial Institutions such as Venture Capital scheme. Banking and Financial Institutions are expected to fund the Green Energy with incentives, i.e lending rate is 2 % below the central bank rate. Establish the rules of green banking in Banking and Financial Institutions sectors, this incentive for developers of renewable

energy with a more attractive landing rate and below market rate so business people can obtain reliable funding sources for renewable energy projects.

3. Local Government should issue a Spatial Planning and Regional Governance and People's obvious that Employers have a legal framework in the area of Forest Plantation use, in addition to the Ministry of Forestry should be able to issue permits use of social forestry with a short time and in the candy should be included at least 20 % social forestry for gardens Energy. Local government should provide education about social forestry for energy.
4. This study can be continued for any type of renewable energy technology based on the amount of power, the power plant site and the technology used.

Acknowledgements, Thank you for The Chairman of Local Government Planning - West Sumbawa Region for supporting this research.

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