Renewable energy development and environmental justice in Thailand: A case of biomass power plant in Roi-Et province*

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Abstract

This paper reviews the policies and practices of renewable energy development and biomass power projects in Thailand. Thailand has allowed private power producers to generate energy from biomass, as an important source of renewable energy, in order to increase energy security and to reduce CO2 emissions. However, some biomass projects in Thailand have resulted in negative environmental effects and social problems, such as air pollution and health problems for villagers near the projects, which thus create environmental injustices. Applying the concept of environmental justice, the research examines impacts and benefits of the biomass project on the environment through a case study in the Roi-Et Province of Thailand. This research also covers how communities, wider societies and the project developers have been affected. A qualitative methodology was adopted to collect various data based on the case study. Project costs and benefits, policy-making processes of the project, and the relations among relevant parties including project beneficiaries, affected villagers and government officers were thoroughly analyzed. This paper argues that renewable energy is not always clean, and that renewable energy using biomass as a fuel will result in environmental injustice problems without proper regulations and good governance by diverse stakeholders.

Keywords: Environmental Justice, Renewable Energy, Biomass Power Plant, Thailand

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Introduction

In facing the dual global crises of climate change and energy insecurity, renewable energy has emerged as an alternative source of power around the world. Thailand is not an exception. Thailand, one of the biggest rice export countries in the world, has promoted private power producers to generate energy from rice husk, one important sources of renewable energy, by providing political and financial support to the biomass energy projects (Food and Agriculture Organization of the United Nations 2015, 18; Papong, Yuvaniyama, Lohsomboon and Malakul 2004).

Previous researches regarding renewable energy have focused on economic benefits of biomass energy development and potential of using biomass to generate electricity in Thailand. However, existing researches have not much considered that biomass energy development and Very Small Power Producer (VSPP) programs – under 10 MW power plant projects – have possibilities to create environmental problems and health problems of villagers near the under 10 MW biomass power plants. (Papong, Yuvaniyama, Lohsomboon and Malakul 2004; Juntarawijit and Juntarawijit 2012; Sukkumnoed, Sabrum and Nuntavorakarn, 2008; Barz and Delivand 2011). This paper points out that renewable energy is not always clean, and that renewable energy using biomass as a fuel will result in environmental injustice problems without proper regulations and good governance by diverse stakeholders.

In Roi-Et, Thailand, there are three biomass power plants located within a single plot of land of 300 meters square. First biomass power plant, which has 9.95 MW in capacity, has been operated by EGCO (Electricity Generating Public Co.) since 2002. The second, a 6.4 MW biomass power plant and the third, a 9.9 MW biomass power plant, started operation in 2004 and in 2009 respectively under the control of Buasommai Company. Among three biomass power plants, two biomass power plants of the Buasommai Company have caused serious environmental problems such as air pollution and water pollution, which is directly related to health problems such as skin allergy and asthma in the adjacent communities (Focus on the Global South 2012; Sarnsamak 2012). This situation constitutes an environmental injustice.

The concept of environmental justice is *"the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."* ("What is environmental justice?" 2015) Three key concepts of environmental justice are: 'distributive justice' that refers to distribution of environmental benefits, harms and risk; 'procedural justice' which refers to access to information and participation in decision-making processes; and 'justice as recognition' which means equal recognition of different social groups. Applying the concepts of environmental justice, the research aims to examine the impacts and benefits of the biomass project on environment, affected communities, project developers, and wider society through a case study in Roi-Et.

Qualitative data was collected during 8 days of fieldwork in Roi-Et. Observation near the power plants and villages, interviews with key informants and affected villagers and one focus group discussion with leaders from three villages (Moo 10, 12 and 13) were conducted to collect data with a Thai-English translator in the field.

This paper begins with a brief explanation of environmental justice in the context of Thailand, followed by an overview of biomass energy development in Thailand. Then, the paper moves on to environmental injustice problems of biomass power plants by analyzing distributive justice, procedural justice and justice as recognition in each section based on the case study in Roi-Et. In conclusion, this paper argues that renewable energy using biomass as a fuel will result in environmental injustice problems when proper regulations and good governance are not instituted.

The Concept of Environmental Justice

The concept of environmental justice can be a relevant framework with which to analyze Thailand's biomass energy projects' social and environmental impacts during the preparation and implementation processes. Since the concept consists of distributive justice, procedural justice and justice as recognition, development projects' multidimensional impacts can be identified in a systematic way (Walker 2012) see Table 1.

Table 1 The Concept of Environmental Justice

Environmental Justice		
Distributive Justice	Procedural Justice	Justice as Recognition
Equal distribution of environmental harms, risks and benefits	Access to information, public participation and access to justice	Equal recognition of people, groups or places

The environmental justice movement in the United States (US) in the late 1970s introduced the term environmental justice. African-Americans protested against dumping of toxic wastes in a landfill in Warren County, North Carolina in 1982 (Schroeder, Martin, Wilson and Sen 2008, 547). Furthermore, explosions in the Union Carbide chemical plant in Bophal, India and a gas plant in Mexico City injured and killed a number of residents living near the plants (Schroeder, Martin, Wilson and Sen 2008, 547-548). Due to these accidents and following protests of villagers, environmentalists realized that environmental problems and risks are not distributed equally between race, class, gender or countries. In this context, the concept of environmental justice emerged as a framework to explain the inequality of environmental impacts.

As the concept of environmental justice has been globalized beyond the US and applied to environmental inequality problems around the world, its focus has become more inclusive. While environmental justice used to emphasize primarily race or ethnicity in the past, it becomes more aware of differences among gender, income and age as well as the rights of future generations (Buckingham-Hatfield, Reeves and Batchelor 2005; Dobson 1998, Walker and Bulkeley 2006, 655). In other words, 'justice to whom' became more inclusive of other environmental issues experienced by vulnerable social groups beyond the racially marginalized.

The framework of environmental justice, firstly used in the US, has been transferred to other parts of the world such as the UK, South Africa, and South America, but the application of the frame in Asia is still rare (Walker 2012). Even though there is not a great deal of existing research applying the concept of environmental justice in Thailand, it does not mean that Thai scholars and civil society organizations (CSOs) have not studied and worked on issues related to environmental injustice problems in the country. They have focused on conflicts caused by large-scale development projects and pointed out the lack of public policy processes by applying other terms such as environmental equity or inequality (Sukkumnoed, Sabrum and Nuntavorakarn 2008; Sajor and Ongsakul 2007).

Recently, Middleton (2012) has applied the concept in the Mekong region in order to address regional energy trade projects, which have created environmental and social inequalities across the borders among Thailand, Laos and Myanmar. Nevertheless, the concept of environmental justice is still new in Thailand and Southeast Asia. Therefore, this paper provides a new insight how the environmental injustices occur in Thailand by analyzing a case of biomass energy development in Roi-Et. This approach is helpful to systematically analyze the problems and impacts of the renewable development projects in Thailand. Next section briefly explains the policies and status of renewable energy as well as biomass energy development in Thailand.

Overview of Renewable Energy and Biomass Energy Development in Thailand

Main objectives of Thailand's energy policies are to reduce energy dependency on imports, to promote renewable energy and to reduce CO_2 emissions under the Energy Industry Act 2007, which is the key law governing energy sector in Thailand (Energy Policy and Planning Office 2012b). Renewable Energy Development Plan (REDP 2008-2022) was enforced to realize the policy objectives under the Act. The main goal of the plan was to increase the share of renewable energy to 20% within 15 years. However, in 2011, the plan was revised to the Alternative Energy Development Plan (AEDP 2012-2022) and it aims to increase the share of renewable energy to 25% of Thailand's energy demand (Energy Policy and Planning Office 2012b; Greacen and Greacen 2012, 8).

In addition, Thailand has carried out several practical policies to promote grid-connected renewable energy development. Thailand started the Small Power Producer (SPP) and Very Small Power Producer (VSPP) programs to support Thailand's distributed electricity structure. SPP program was initiated in 1992 for private companies to generate electricity (up to 90 MW) through fossil fuel cogeneration and renewable sources. However, because of high bureaucratic barriers, power plants with planned capacities of around 10 MW were unable to apply for the SPP program (Greacen 2013). Therefore, in 2002 Thailand initiated the VSPP program for only renewable energy sources up to 1 MW only to be exported into the power grid. In 2006, this program was revised to include not only renewable energy but also fossil fuel cogeneration energy projects up to 10MW (Greacen 2013).

In this context, Thailand has provided access to grid and instruments such as Feed-in Tariffs (FiTs), low-cost financing, and tax incentives so that SPPs and VSPPs can promote renewable energy development. Especially, biomass has been used as the major renewable energy source in Thailand. This is because Thailand, as one of the top producers of agricultural products including rice, sugar, oil palm and coconut, has a great potential to develop the biomass energy projects in the country. In fact, biomass accounts for 69.7% (851.685 MW out of 1221.871 MW) and 82.8% (614 MW out of 741.11 MW) under the VSPP and SPP renewable energy program respectively (Energy Policy and Planning Office 2012a; 2012b).

As biomass is one of the most important renewable energy sources, under the SPP and VSPP Program, 88 biomass power plants are currently operating, and 284 biomass power plants are planned for operation in Thailand. Out of the 88 operating power plants, 22 biomass power plants (25% of the total) have installed capacity greater than 10 MW up to 90 MW under the SPP Program, and 66 biomass power plants (75% of the total) are operating under the VSPP Program (Energy Policy and Planning Office 2012a; 2012b).

Even though the idea of renewable energy and biomass energy to use agricultural waste such as rice husk, bagasse or wood waste is fundamentally good for environment as well as energy security, it does not mean that practices of such concept are always good. Moreover, since different biomass projects require different technologies, they have potential to result in different types of environmental issues. In fact, in case of biomass power plants, which use rice husk as a fuel, pollution and villagers' health problems are emerging as new social issues and concerns in Thailand (Tangwisutiju 2009). In the next section, problems of biomass power plants are addressed through the conceptual framework of environmental justice of the case of Roi-Et.

Environmental Injustice of Biomass Power Plant in Roi-Et Province

Overview of Biomass Energy Development in Roi-Et

In Nuamuang sub-district, Muang district, Roi-Et province, one rice mill and three biomass power plants, located in a single plot of land within 300 square meters, use rice husk as a main fuel. The rice mill, owned by Buasommai Company, and the company has two biomass power plants – 6.4 MW and 9.9 MW – inside the rice mill under control of the Buasommai Electricity Generation Company Limited. The other biomass power plant, named Roi-Et Green Biomass Power Plant, is operated by EGCO, one of the biggest Independent Power Producers (IPPs) in Thailand, which has capacity of 9.9 MW.

The rice mill was very small when it was first built in 1980. Then it was expanded twice, in 1992 and 1994, into a large rice mill, which can process 1,650 tons of paddy per day (Buasommai I Biomass Power Plant 2006, 37). In 2003, the first biomass power plant in the province, Roi-Et Green Biomass Power Plant operated by EGCO, started operating by buying rice husk from the Buasommai rice-milling company. Through this business with EGCO, Buasommai Company realized that rice husk is a valuable energy source for generating electricity. Buasommai Company decided to construct its own biomass power plants. As a result, 6.4 MW and 9.9 MW Buasommai biomass power plants have been operating since 2006 and since 2009 respectively.

The rice mill and three biomass power plants are located in a residential area. Within 3 km from the biomass power plant complex, there js one elementary school and three villages, Moo 10, Moo 12 and Moo 13, where 988, 691 and 1098 people live respectively. During the winter season from October to January when wind blows from the biomass power plants to these villages, residents suffer from smoke and dust of biomass power plants, especially from the two Buasommai biomass power plants. Until the first Buasommai biomass power plant started to operate, villagers did not experience serious health problems even with the first EGCO-operated plant around. Therefore, in 2006, the leadership of village headmen organized a network to monitor the impacts of biomass power plants in the Nuamuang sub-district (former Moo 13 village headman, personal communication, June 29, 2013). In following sections, the Buasommai 9.9 MW power plant is analyzed from the perspective of distributive justice, procedural justice and justice as recognition.[1] Aspects of the plant operation are constructed with the Roi-Et Green biomass power plant operated by EGCO.

[1]Since no information about the 6.4 MW was provided by Buasommai Company and both biomass power plants are established and operated by the same company, the following sections focus on the 9.9 MW power plant and assume that both power plants follow similar procedures.

Distributive Justice

Among the benefits of biomass energy development, the most obvious one is the extra income that biomass power plant companies receive through selling electricity to the Provincial Electricity Authority (PEA) or Metropolitan Electricity Authority (MEA), state-owned distribution systems. The 9.9 MW Buasommai biomass power plant sells 8 MW, and the Roi-Et Green biomass power plant sells 8.8 MW to PEA. Also, since the biomass energy is classified as renewable energy, when power producers sell electricity to power utilities, they receive an additional payment called an "adder" on top of normal prices, which adds US $0.01 per kWh for biomass power plants with installed capacities higher than 1 MW (Tongsopit and Greacen 2013, 439, 442). This means that biomass power plants can sell electricity at a higher price by using rice husk, which is an agricultural by-product from the rice mill, without extra costs.

Prior to the construction of the Buasommai 9.9 MW biomass power plant, Buasommai Electricity Generating Company applied for Clean Development Mechanism (CDM) and claimed to the United Nations Framework Convention on Climate Change (UNFCCC) that the biomass power plants would bring environmental, social, and economic benefits to nearby area. The reasons were the following: First, biomass power plants would solve the environmental problems caused by decaying rice husk from the rice mill. Secondly, poor households could generate extra income by selling rice husk or other biomass to the company. Thirdly, job opportunities would be provided to the villagers in the local area. And lastly, the biomass power plants would create cash flows for the local economy (Buasommai I Biomass Power Plant 2006).

However, residents of Moo 10, 12, and 13 totally disagree with the company's claims by stating that households have not earned extra income because they have only small rice paddies, around 4 or 5 rai (1 rai = 0.16 hectare), for their family. In fact, Buasommai biomass power plants buy rice husk for 600 Thai Baht per ton, and Roi-Et Green power plant pays 900 Baht per ton. The additional income from selling rice husk is therefore comparatively small. In terms of the job opportunities in the biomass power plants, people do not want to work there because they believe that working inside the biomass power plant is dangerous. Villagers said that workers come from other nearby provinces such as Si Saket, Buriram, and Surin provinces. Regarding the local economy, village headmen said that the cash flow is just for the biomass power plants, not for local economy and villagers. They strongly stated that there were *"no benefits, just costs from the biomass power plants"*.

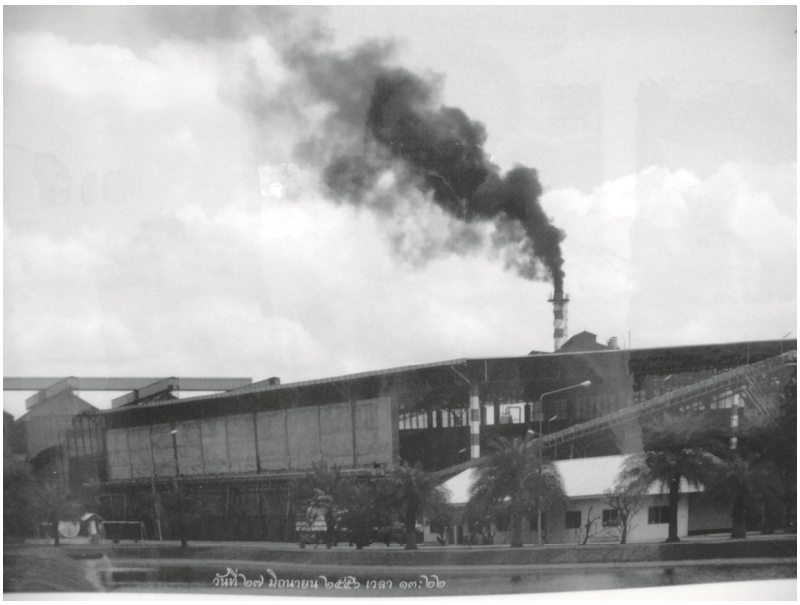
What are the costs villagers have to pay? The most serious problems caused by the Buasommai biomass power plants are smoke from the two stacks as well as dust from the rice husk ware house and transportation which carries rice husk to the plants. This smoke and dust creates air pollution in the villages during winter season (See Photograph 1). Most households in Moo 10, 12, and 13 and the

elementary school have experienced black ash problems from the smoke, which covers everything including the roofs of the houses, grounds of the school, rice paddies, and trees.

Cleaning the school is a new burden for the teachers and students. President and vice president of the elementary school said that the first thing to do at school during the winter season is to clean the school and classrooms. However, 15-20 minutes later, everywhere becomes dirty again with the dust and ashes blowing from the biomass power plant. Furthermore, they mentioned they cover the windows with plastic wraps and let students wear mask to protect their health in winter. Even in mid-June when the fieldwork was conducted, ash on the school water system was observed. It is easily predicted that more ash from smoke will blow to school and villages during winter season.

The situation is similar with the residents in this area. The villagers responded that their houses are covered by black ash from the stacks of Buasommai biomass power plant in winter. In addition, villagers are suffering from health problems. They said they could not sleep well at night because of the noise from the biomass power plants and the smoke. They added that the noise was louder at night because the surroundings are very quiet compared to the daytime, which make them wake up frequently during sleep. They also felt that they could not breathe well because of the smoke while they sleep at night. Villagers as well as students have skin allergies, which make their skin itchy, as well. Even worse, the ashes and rice husks on the road sometimes go into people's eyes. One woman said she was not aware of the impact so she rubbed her left eye when with the ash in it. This, she said, made her lose vision of her left eye.

Figure 1 Black smoke from the stack of the 9.9MW Buasommai biomass power plant on June 28, 2013



In addition, the ashes affect villagers' drinking water. In rural areas, villagers still use rainwater for everyday use, such as drinking, cooking, washing, bathing and so on. However, after the operations of the first biomass power plant in the area, they could not use rainwater anymore because ash from the biomass power plants would cover the roof and contaminate the rainwater. Therefore, they have no choice but to buy drinking water and use the public water system.

In terms of economic harm, smoke and ash have affected productivity of fruit trees and rice paddies of villagers. Some villagers experience the fruits of the mango and papaya trees cannot grow well. Worse, some villagers gave up harvesting rice of 3-rai paddy. Since harvest season in winter season in Roi-Et, which is when the most severe smoke blew from the biomass power plant, they felt that they might die from the black smoke

In summary, while the biomass power plant developers receive benefits by selling electricity and receiving as an adder from the Thai government, villagers living near the biomass power plants experience negative impacts, including environmental harms, health problems, and economic burdens. In other words, the Buasommai biomass power plant created distributive injustice problems within Roi-Et. So, how did this problematic biomass power plant start its operation in this area? Next section points out that there was a lack of procedural justice in the project planning and practice.

Procedural Justice

Buasommai Company did not provide the villagers with any information or opportunities for public hearings before constructing both biomass power plants. Villagers and school staffs said no one came to the villages and school to explain their plans and ask for villagers' permission to build biomass power plant in this area. On the other hand, when the other biomass power plant operated by EGCO, Roi-Et Green biomass power plant, was planned to be constructed and operate in Roi-Et in 2002, the company invited villagers for the field trip to observe a situation in other provinces where the EGCO had operated power plants, and showed that there was no serious problems with villagers or environmental impacts. This field trip with villagers was conducted prior to construction, and villagers agreed to construct Roi-Et Green power plant in the area after the field trip. President and vice president of the school also mentioned that EGCO staffs visited school to explain their plan to build biomass power plant near the school and they were invited the field trip. After coming back from the field trip, school staffs who attended the trip shared their observation and opinion and then they gave the permission to build the biomass power plant. However, villagers and school staffs pointed out that in the case of Buasommai biomass power plant, there was no chance to listen to the company's plan, and company just started constructing the 6.4MW biomass power plant in 2003.

The second biomass power plant of Buasommai, which is 9.9MW in capacity, also started to be constructed without villagers' permission. Two households, one right next to the main gate and one immediately next to a rice husk warehouse of the Buasommai biomass power plants, said none of the company staffs or managers has ever visited the houses.

According to a report about the Buasommai 9.9 MW biomass power plant submitted by the company to the CDM Executive Board, there were no public hearings to explain the development project and listen to villagers' opinions before signing the construction contract. Instead, the company held a stakeholder's meeting while the 9.9 MW biomass power plant was under construction. However, a village headman criticized that the objective of the meeting was not to ask villagers' permission to construct or operate the biomass power plant, but to inform and explain the company's plan to villagers. In summary, the residents have neither received sufficient information to understand what was going on near their homes, nor given proper opportunities to express their concerns and opinions.

Table 2 Major events related to the operation of Buasommai 9.9MW biomass power plant

Date	Event/action
September 2007	Signing of construction contract
October 26, 2007	Finalization and signing of Bank Loan Agreement based on the consideration of revenue from CDM
October 2007	Start of construction
September 2008	Stakeholders' meeting at Petcharat Garden Hotel, Roi-Et
November 2008	Stakeholder feedback consultation at the project site, Roi-Et
December 2008	Construction completed
February 2009	Going into full operation

In terms of access to justice, villagers of Roi-Et filed a lawsuit to the Regional Administrative Court in Ubon Ratchathani province. When the villagers sent a letter to the court the first time, the court rejected the claim because the letter was not written in proper legal terminology. After revising it, they re-sent the letter and argued that the provincial government of Roi-Et had paid little attention to the people's problems with the biomass power plants and did not take responsibility to solve the problems. After the second claim was accepted, the court asked for the provincial government officers to check and review the Buasommai biomass power plants. Two months later, villagers went to the court to hear the result, but the decision

was to first give enough time to the company to solve the problem by itself and to observe any improvements. Villagers were very disappointed with the result because they felt even the court is not on their side. Although there was an opportunity for villagers to claim their rights to the court in Thailand and they attempted to do so, their access to justice was not genuinely realized in this case.

Justice as Recognition

Justice as recognition emerged as another main concept of environmental justice to supplement distributional justice and procedural justice. Justice as recognition deals with the misrecognition of some people, groups and places in comparison to others, for example those divided along lines of gender, race, religion, ethnicity and so on (Walker 2012, 50). Therefore, the concept of justice as recognition focuses on the *"cultural and institutional processes of disrespect, denigration, insult and stigmatization which devalue particular people or places"* (Walker 2012, 35). Justice as recognition is a crucial concept of environmental justice in a way that lack of recognition causes not only inequitable distribution but also further distributive injustices (Schlosberg 2007, 14).

In context of biomass power projects in Thailand, this article focuses on institutional processes such as the regulation of the VSPP program, the Energy Regulatory Commission (ERC)'s recognition of the VSPP program and biomass power plants and biomass power plant developers' recognition of the impacts on villagers living near the power plants.

According to the Enhancement and Conservation of the National Environmental Quality Act (NEQA) of 1992, any kind of thermal power plants, which include biomass power plants, exceeding 10 MW in capacity should submit the Environmental Impact Assessment (EIA) report to the Office of Natural Resources and Environment Policy and Planning (ONEP) while applying for a permission of project construction and operation. It means that VSPPs who plan to build power plants under 10 MW in capacity have no duty to carry out EIA process. In this sense, developers prefer to construct biomass power plants under 10 MW to be exempt from such requirement and therefore minimize the permitting process works.

In addition, according to the "Regulation for the Purchase of Power from VSPPs (for the Generation Using Renewable Energy)," only technical regulations are mentioned to govern the synchronization of VSPPs to the system of Distribution Utility, which is a power purchaser. There are no environmental regulations to prevent environmental impacts of the VSPPs, which might occur in the future. People think that small-sized power plants using renewable energy sources are less harmful than mega-sized projects using fossil fuel. One of the main objectives of power purchasing from VSPPs is to "lessen the environmental impact." (EPPO Unknown)

The Buasommai Company argues that its biomass power plants will help conserve fossil fuel because the projects use biomass as one of the main sources for renewable energy (Buasommai I Biomass Power Plant 2006). The company also emphasizes that the projects can

reduce the amount of rice husk as one of the agricultural wastes, and thus prevents problems of decaying biomass at local level. However, the problem is that both the company and the EGAT have just focused only on what energy source power plants use as fuel while neglecting the negative impacts of biomass power plants on the environment and villages in the process of generating electricity.

In particular, direct-fired technology, which is used in the Buasommai biomass power plant, risks the release of harmful pollution, though the technology is simple to install. However, since technical standards for pollution control systems do not exist in the environmental regulatory system in Thailand, what kind pollution control system is installed depends on project developers (Juntarawijit and Juntarawijit 2012).

Consequently, policy makers' perception that renewable energy and very small power projects are good for the environment has an influence on the creation of insufficient regulations to prevent the negative impacts of biomass power plants on the environment and surrounding communities.

Conclusion

Renewable energy is not free from the impacts on the environment and nearby communities. As shown in the Roi-Et cases, biomass power plants, producing less than 10 MW using rice husk combustion systems, can have potential to create environmental damages, health problems, and economic harms to villagers, resulting in environmental injustice.

In terms of the distributive justice, while the biomass power plants receive benefits by selling electricity to government at higher price, villagers have been suffered from environmental, economic, and health problems. Worse, villagers are worried about risk, which can happen to their future generations. Benefits, harms and risks are not distributed equally between project developers and villagers. In terms of procedural justice, villagers were not properly informed with the plan of constructing biomass power plants as well as their benefits and risks. Public participation was not sufficient, either. A Stakeholders' meeting was held once, only when construction of the plant was almost finished. Villagers tried to use legal system to solve the problems but the national court did not recognize their claim.

This whole environmental injustice problem of biomass power plants is caused by lack of justice as recognition. Since Thailand policy makers, especially in the energy sector, did not recognize negative impacts of renewable energy including biomass power plant, there were no proper regulations on operating biomass power plants. It is not mandatory for power plants projects producing less than 10 MW to submit EIA report as a minimum requirement in Thailand. Therefore, we should remember that renewable energy could be harmful for the environment and people without proper regulations and management. Current regulations on renewable energy development projects are still insufficient to prevent and protect the environment and villagers' rights in Thailand.

Villagers living near the biomass power plants in Roi-Et have started their own movement in earnest to ask for the provincial government to take its responsibility for people and force the company to solve the problem since last year. As a result, a committee, composed of provincial officers, TAO officers and affected villagers, was formed to discuss biomass power plant issue with the biomass power plants developers. Since January of 2013, monthly meetings have been held in the biomass power plants so far, and some problems have been solved. For example, a rice husk warehouse was constructed to prevent dust even though the main problem, the smoke from the smokestack, is still there.

Therefore, with the proper implementation of regulations and policies, as well as the recognition of the negative impacts of renewable energy projects, especially of biomass power plants less than 10 MW, coupled with greater accountability from the business sector and government, both the central and provincial are required in order to ensure environmental justice in Thailand.

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