Alternative Power Production for Sustainability and Justice for Local Communities

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Introduction

As the construction of power plants increases to meet rising demand for electric power, debate is also increasing over the relative merits of conventional power plants[1] (CPP), including large hydropower dams and nuclear power stations, and new renewable energy power plants (NREPP),[2] such as wind power, solar PV, biomass, and micro hydropower plants. All power sources impact on the production of green house gases (GHG) and all have impacts on the lives of local people. This paper focuses on:

1. A comparison of the social, economic and environmental aspects of power management in Indonesia and Japan.
2. The search for solutions and policies that are both just and help manage conflict in relation to the effects of plants on local communities.

The researcher conducted a desk review and visited local communities around power plants in both countries. The positive and negative effects of CPP were compared to NREPP. In order to protect the privacy (and in some cases the safety) of respondents, most sources remain anonymous.

INDONESIA

Power production in Indonesia

In 2009, the population of Indonesia was more than 240 million. The country's energy needs were met by coal (41 percent), oil (29 percent), gas (16.3 percent), large hydropower dams (7.8 percent), and other (5.8 percent). In 2011, the Perusahaan Listrik Negara (PLN) or State Electricity Company, which has a monopoly on electricity distributer in the country, stated that Indonesia had a total potential capacity for electricity production of 28,462 MW, including from coal (42.2 percent), diesel (23.7 percent), natural gas (22 percent), large hydropower dams (6.7 percent) other renewable energy (5.4 percent).

The Ministry of Energy stated that only 70 percent of the population had access to electricity. If current plans bear fruit, this would increase to 80.24 percent by 2014. Economic growth and demand from the expanding industrial sector as well as the general population is pushing the government towards the construction of large-scale power plants.

In 2009, Indonesia had the highest emissions of green house gases in Southeast Asia and was the 16th highest producer in the world.[3] In the same year President Susiro Bambung Yudoyono announced at the G-20 and COP15 conference that Indonesia would aim to decrease the rate of greenhouse gas emissions by 26 percent by 2020, through the development of alternative energy sources and improved power conservation. Thus Indonesia now plans to support the establishment of many large and small power plants.

In order to examine the local contexts for such plans, the researcher conducted field work among the Kanci-Kulon and Waru Duwur village communities near the Cirebon coal power plant in Cirebon City, West Java, and among the communities around a micro hydropower plant at Cinta Makar village, Subang, West Java and a solar power plant at Banyumeneng, Yogjakarta.

Case study (CPP): Coal power plant at Kanci-Kulon and Waru Duwur villages near Cirebon City, West Java

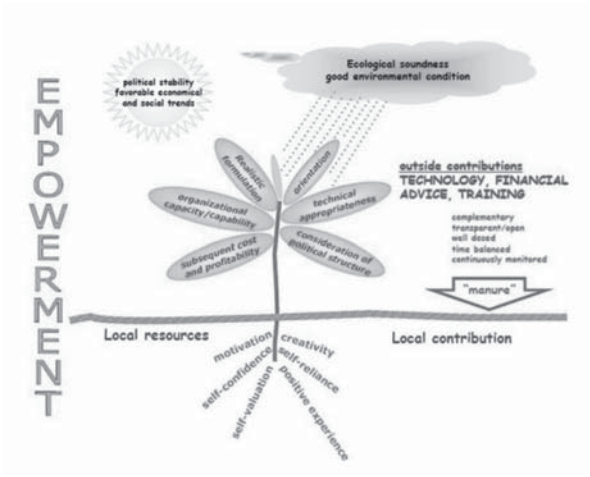
This coal power plant is situated 240 kilometers east of Jakarta and is operated by Cirebon Electric Power, a private company. The project was started in 2007 and it is expected to be completed in 2011. Production capacity is 660 MW.

Relationship with community

The power plant is run by a private company which communicates with local villagers mainly through community leaders and local government officials. There have been a series of difficulties in the relationship between the company and locals, and the *Gotoroyong* system (a local community support system) has broken down. Staff turnover at the plant has been high. Migration into and out of the community has also been high. This has had negative effects such as an increase in local "widows" (of men who came to the plant and then left) and an increase in the rate of single mothers. The incidence of HIV has risen and there are an increased number of sex workers working in small public houses (bars and restaurants) near the plant.

Case study (NREPP): Micro Hydropower plant at Cinta Mekar village, Subang, West Java

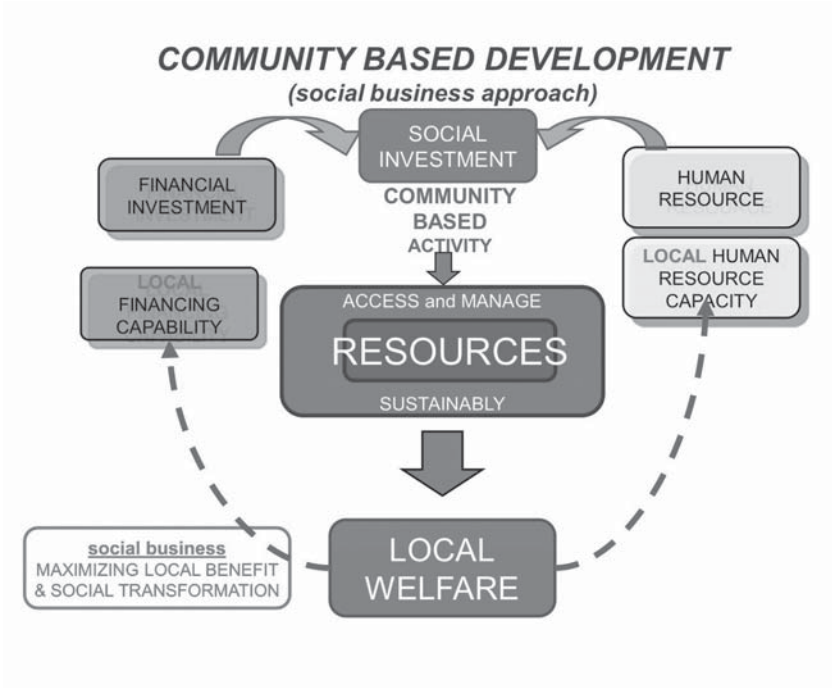
The community-operated micro hydropower plant in Cinta Mekar, 150 kilometers southeast of Jakarta, has a production capacity of 120 KW. The plant was established in 2004 as a result of community demand. Previously, the area had no electricity supply and was one of the poorest villages in Subang. The plant is operated by PT Hidropiranti, a community organization which promotes local social and economic development and is also supported by the social empowerment organization IBEKA (Institut Bisnis dan Ekonomi Kerakyatan).



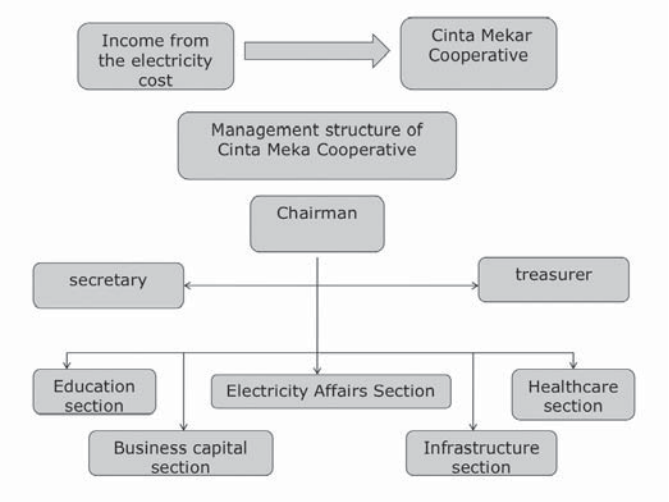
Relationship with community

The plant operator coordinates with the local people and manages the plant together with locals through a cooperative system which includes a local committee. IBEKA has supported mutual understanding between both sides from the beginning. The cooperative will distribute income from the sale of electricity to the local people and offer soft loans to local businesses in order to promote the local economy and reduce poverty.

IBEKA: Structure for working with the local community.



Structure of the cooperative of Cinta Mekar



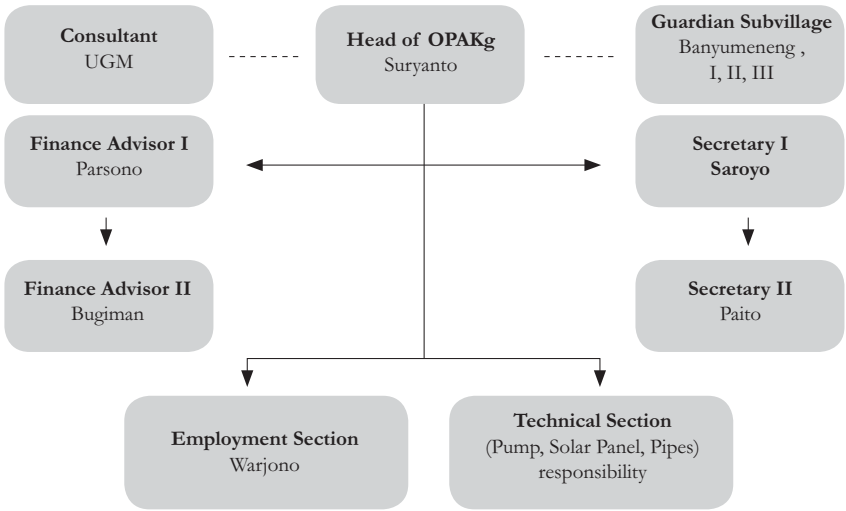
Case Study (NREPP): Electricity Production from Solar PV at Banyumeneng village, Yogyakarta

The Solar PV power plant at Banyumeneng, 30 kilometers west of Yogyakarta, has a production capacity of 1000w. It is under the coordination of the Kamase group, a student body from Gajah Mada University (UGM). The engineering students received a Mondialogo Award (2006-2007) to promote the venture as a cooperative effort between students and the local community. Students began by researching local power demands, and found that this village had a strong and enthusiastic leader who was keen to cooperate. In 2008, the students set up a project to improve local water quality in the community. In 2009 the students then installed a solar PV unit together with a pumping system in order to distribute water within the village. Then, they began training locals in the operation of the system.

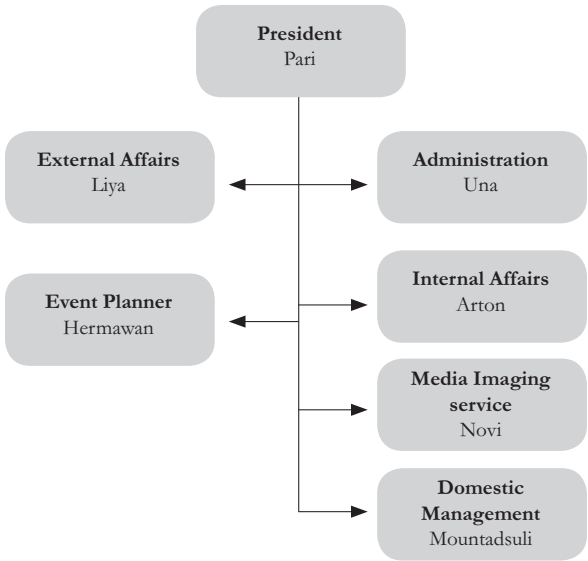
Structure and Management

The plant structure and management system included students and community members. A student committee assisted the locals with technological know-how in how to operate the system. The community was responsible for the financial management of the system and for maintaining it.

Structure of OPAKg[4]



Structure of Kamase Group



JAPAN

Power Production in Japan

Japan is one of the most modern countries in Asia and electricity is almost universally available. In 2010, Japan had a power capacity of 282 GW. the third in the world after the United States of America (USA) and China.[5] Power provision was controlled by 10 private companies which operated in different regions of the country, under the law and supervision of the government. However, 96 percent of the sources of power energy were imported. In 2010, sources of energy included coal (26.8 percent), natural gas (26.3 percent), nuclear (24 percent), oil (9.7 percent), water (7.1 percent) and others (6.1 percent). The ratio of CO2 emission was the fifth highest in the world and the third highest in Asia after China and India.[6] In 2011, Japan had the second highest electricity usage in the world after China.[7] Before the Fukushima nuclear disaster on 11 March 2011, Japan planned to increase power supply allocation by 2019 as follows; nuclear (41 percent), oil (5 percent), natural gas (22 percent), water (9 percent) and renewable energy (2 percent).

After the Fukushima disaster, the Japanese government set up a special committee to reconsider the country's energy plans. By August 2012, it had yet to report on its findings. Civil society groups were pushing for the following allocation for energy supply source by 2030; promote energy efficiency (25 percent), fossil fuels (40 percent), renewable energy (35 percent). It was claimed that this would decrease the CO2 emission rate by 16 percent.

The business and industrial sectors pushed to increase energy efficiency by 10 percent by decreasing the use of fossil sources of energy as much as possible, and promoting renewable power plant to 25-30 percent. This sector proposed keeping power from nuclear energy at 15-25 percent[8] in order to fulfil the target to decrease CO2 emission rate to 23 percent.

Structure of electricity companies

The researcher studied documents and conducted fieldwork to assess the effects on local communities of the CPPs operated by KEPCO (Kyushu Electric Power Company), i.e., the Kenkai Nuclear Power plant and the Matsuura Coal Power Plant; and private NREPP, i.e. the micro hydropower plant of the New Engineering Development Co (NED) in Tabuchi Ichihara, Chiba prefecture, and the Solar PV plant operated by the Tampopo group in Fukuoka prefecture.

Case study (CPP) Kenkai Nuclear Power Plant, Higashimatsuura Imanura, Genkai Oaza, Saga Prefecture

This power plant is under the management of KEPCO. It is among the first generation of nuclear power plants in the country, and is the largest power plant in Kyushu. It was established in 1960, started to generate power in 1975, and will continue to generate power until 2033.[9] At present, production capacity is 3478 Mw and electricity is distributed through the southern part of Japan, mainly for cities in Kyushu island.

Structure and Management

The plant is a private company. An interview with a staff member of the KENKAI Nuclear Energy Education Center indicated that the plant was established as a result of Japan's economic and social development after World War II. The plant establishment was approved by central and local government. The land was bought from local people and there was no conflict. Income from the plant was distributed to the local community and partly

used to develop public facilities. The education center was created to educate people and train staff about nuclear power, under a sub-contracting system. This system also meant the people had jobs and earned income. The staff member said that after the Fukushima disaster, visitor numbers declined as concerns about nuclear power and safety rose.

Case study (CPP): Matsuura Coal Power Plant, Nagasaki, Japan.

The power plant in Matsuura consists of two plants. Matsuura Kyushu coal power plant is under the operation of KEPCO and is a first-generation plant. It was established in 1989 with a production capacity of 700 MW. Matsuura EPDC coal power plant located nearby is operated by J Power Co., Ltd and has a production capacity of 2000 MW. The total capacity of power plants in Kyushu is 2700 MW. which is the second biggest plant production capacity in Japan after the Tachibana-wan Coal Ultra Supercritical Power plant with a production capacity of 2800 MW. Both Matsuura plants are the main electricity sources for the southern part of Japan.

Structure and Management

The production, operation and distribution system is the same as that of the KENKAI Nuclear Power Plant as it is under the control of KEPCO.

Case study (NREPP): Micro Hydropower Plant in Tabuchi Ichihara, Chiba prefecture.

The micro hydropower plant of the New Engineering Development (NED) company started operations in 2010 to produce renewable energy, to reduce the CO2 emission rate.

Structure and Management

This micro water power plant is managed by New Engineering Development (NED) a private company research team. The company has tried to promote the scheme among the local community and the government. The company will sell and maintain the system for the community. Local interest in the scheme has increased as local people can earn income from selling the electricity they produce to the larger company. The plant has a production capacity of 5.5 MW. which was able to serve only office buildings and was not able to feed into the electricity grid system as there was not enough steam power.

Case study (NREPP): Solar PV of Tampopo at Kusagae School and Futabayouchien School, Fukuoka prefecture.

Structure and Management

The Tampopo project started in 1989, three years after the explosion at the Chernobyl nuclear power plant. The project began as a result of discussion among some women in the community who wished to test the production of environmentally friendly electricity. They started at the Fukuoka prefecture area. A small group began in 2000 by investing donated community money to install a Solar PV for the village temple. Solar PV was selected because it is easy to maintain and the supplier guaranteed maintenance for 15-20 years.

Community members found the system practical, and membership increased. In 2005, the group was registered as a non-profit organization (NPO) in order to promote Solar PV usage and to install systems at kindergartens and temples in the community. Different committees were formed to operate and promote the scheme. Meetings were held in villages every three months to report on progress. In 2012 there were 60 members and they had installed a Solar PV to one temple and two kindergarten schools. In each place, it took between one and two years to establish the right understanding among people in community before installation. At present, solar PV of Kusayaka school and Futabayouchien school had a production capacity of 10 Kw.

Table: Comparing impacts on local communities of coal power plants in Indonesia and Japan.

Impacts	Ceribon coal power plant in Indonesia	Matsuura coal power plant in Japan
Capacity / Location	660 MW. / In the community	2700 MW. / 2 Km from the community
Social	The majority of local people were not informed about the construction of the power plant. Many villagers have not received compensation. People have lost their trust in community leaders.	The local government and local people have a right to stop the operation of the power plant, if it causes trouble to the people. The power plant must immediately pay a large amount of compensation to the people in the event that they are negatively affected.

Impacts	Ceribon coal power plant in Indonesia	Matsuura coal power plant in Japan
	- Loss of friendship in the community. People do not trust each other as in the past. Locals have divided into two groups. - Many locals have relocated to work at other towns. Family members are separated. The number of immigrants has increased. The relationships among people in the community have been affected as the newcomers have less sense of belonging to the community. - Prostitution has risen to serve the newcomers. The number of teenage pregnancies has increased as many women were abandoned by husbands that come to work in the plant. - The local's requests for justice and compensation have not been responded to.	- Representatives from local community and local government will inspect the power plant operations regularly, according to a schedule.
Environment	- The power plant is equipped with a pollution control system. It aims to control emission of sulfur dioxide and carbon dioxide. However, villagers have complained about eye irritation and black smoke during the power plant's operation. - The operation has caused a high level of noise which badly disturbs people at night. - Uncontrolled coal dust has blown into the community. - Output from farms such as rice and fruits are reduced from the previous year. - There was a case in which farmed fish and green mussels in the coastal zone died as a result of drainage waste water entering the sea from the power plant.	- The power plant is equipped with an effective sulfur dioxide and carbon dioxide emission control system. - The power plant is equipped with an effective noise control system. - Coal is transported via pipes to prevent air pollution. However there were instances in which coal dust in the process blew into the air. The power plant accepts that it is difficult to control and has received some complaints. - Waste water is treated before being released to the sea.
Economy	- Fishermen have reduced income, they have to travel further away to catch fish. Their expenses have increased. - Salt pans can no longer operate. Salt pan farmers have lost their jobs. - In many families, members have to work at other towns due to loss of income from fishing or agriculture. - Many locals have to find jobs outside their own community, since they have no skills to work in the power plant	- Most locals do not work in the agricultural sector; instead, they work in a city. Only a few people work in the power plant. - There were no fishing activities near the power plant.

Table: Comparing impacts on local communities of micro hydropower plants in Indonesia and Japan.

Impacts	Micro Hydropower plant at Cinta Makar Village in Indonesia.	Micro Hydropower plant at Tabuchi Ichihara in Japan
Capacity / Location	120 Kw / Next to the community (in the village)	5.5 Kw / More than 1 km away from the community
Social	- The locals have worked with a power company and an NGO in power consumption planning and on economic problems of the local community. - No family members have to work outside the community. - Wive's roles and opinions are respected because they have income to contribute to their family. - Women and children of the community have received a certain amount of financial support (medical fees) and vaccines against diseases. - Students have received educational funds, which has reduced the financial difficulty of families.	- The local government must conduct a public hearing and take community representatives to observe the technology before investing in this kind of power plant. However, this micro hydropower plant is operated by the New Engineering Development (NED) company for promote renewable energy
Environment	- Power generation does not produce CO_2 and other kind of pollution. - Good water management enables higher agriculture output, ie rice farms can plant three times a year instead of twice as previously. - Forest and streams around the mountain are protected as they are the only source of the power plant's water supply.	- Power generation does not produce CO_2 and other kind of pollution.
Economy	-There is co-investment between a private company and the locals. Profits from the cooperative will be shared by the members. The cooperative also grants loans to local businesses. -Although this type of power plant does not have a high capacity as others, the amount of power generated is sufficient for the local consumption. -The locals were trained and hired by the company to maintain the plant. - Some locals earned additional income doing temporary work for the company. This allows them to continue to work in their own community.	- If the power plant is built by the decision of the local government, then they have to pay for the installation fees. If the power is sold to a power company, the income goes to the local government. - The amount of power generated is not sufficient for the needs of the community. However, the objectives of this power plant are to (1) create an electricity reserve system for the community in case of an unlikely event and (2) demonstrate the company's technology.

Table: Comparing the impacts on local communities of solar power plants in Indonesia and Japan.

Impacts	Solar Power Plant at Banyumeneng 1 in Indonesia	Solar Power Plant Kusagae school and Futabayouchien school, Fukuoka, Japan
Capacity / Location	1000 w / More than 1 km from the community	≥ 10 Kw. / On top of a school building
Social	- The local people were brainstorming in this project at the very beginning – before any installation. - The locals, students and sponsors had worked together by donating their money and/or manpower to this project. - Local children were inspired by volunteer students who contributed to the community.	- Children have a great opportunity to learn the benefits of solar energy. - Parents can participate in this learning group and can install the system in their own home if they wish. Some families are doing this.
Environment	- Power generation does not produce CO_2. - As the Solar PV generates electricity to pump clean water from the mountain to the community, this has led to an agreement to preserve the forest and water source.	- Power generation does not produce CO_2. - Reduction of use of electricity from a large scale power plant that causes major pollution such as dust and waste water.
Economy	- The Solar PV does not generate a large amount of electricity; however, it is sufficient to run the pump that supplies water to the community. - People no longer buy water from other towns during the dry season. - There is income management from the water trading. They will invest in more Solar PV to produce electricity. It will distribute water to the whole village.	- Reduces school's electricity expense.

Table: Comparing local people's opinions of nuclear power plant at Kyushu area in Japan.

Impacts	Support nuclear power plant	Do not support nuclear power
Capacity	Nuclear power plant can generate a large amount of electricity by using a small amount of energy resources. However, the power plant must be located at a distance from communities.	Although it can generate a large amount of electricity, in unlikely events it is not possible to control the direction and scope of contamination.
Social	- Japan is an industrial country. Therefore, there is a great demand for electricity.	- There are not enough shelters for evacuation, if there are leakages like in Fukushima. - An accident might lead to family separation. - As nuclear radiation is colorless and odorless, it is easy to be exposed to it without realizing. Exposure to nuclear radiation leads to long term health effects such as blood cancer, thyroid, etc. - There is a concern that if the nuclear waste is used for military purposes, it could lead to political conflict and war.
Environment	- Power generation processes do not produce $C0_2$.	- If water or soil are contaminated with nuclear radiation, agriculture produce will also be contaminated and not be safe to eat. - There is not much capacity left to store the nuclear waste. In addition, policies around nuclear energy are still unclear. - Releasing contaminated cooling water to the ocean will affect marine life. The ocean food sources will be contaminated. It is difficult to check on this process.
Economy	- The central and local government receive a great amount of income from the nuclear power plant. This can be spent on various social development projects such as building libraries, parks, cultural leaning center, and Atomic learning center. - The project will distribute income to many stakeholders such as shuttle bus drivers, accommodation businesses and other occupations that are related to the power plant. This also leads to the hiring of workers for other activities funded by the power company such as librarians and staff of several government learning centers.	- People who live near the power plant are exposed to a high risks in their accommodations, food and health. - The government has to pay a tremendous amount of compensation to victims including short and long term medical care. In fact, this has already been the case. - Household income will be affected, as some families or new members have to migrate or find jobs in other areas. - Electricity fees could be more expensive as the company needs to generate more revenue to cover the massive compensation.

Conclusion and Summary

Structure and Management

The management of electrical power is very different in Japan and Indonesia. Indonesia's electricity provision is considerably lower than that of Japan. Power plants in Indonesia are not widely distributed and are not operated with the strong cooperation of local communities. As a result, there are often conflicts between the plants and communities. Operators must receive a license approval from the PLN, Ministry of Energy as well as local government. The approval procedure is complicated. The high operating costs and short concession terms also contribute to creating conflict within communities as investors seek to maximize gains quickly, often failing to work with local communities in the process. Often local people do not know in advance that plants are to be built, and can only protest after construction starts. Local conflicts arise over unfair land prices, evictions from land, etc.

In Japan, electricity is managed by ten private companies which are under the control of the government. These companies are able to set the buying and selling electricity rate to the public and they are also authorized to define the area of electricity distribution and management within their concession areas. However, after the Fukushima disaster, the government has instructed these companies to buy more electricity from small enterprises and from renewable energy sources. A potential weakness is that the policy may allow buyers to buy the electricity from enterprises they are close to, and at a high cost, which may increase the cost of electricity for consumers.

The research found that in both countries government control and private concessions have strong and weak points. In order to increase justice around electricity consumption, every part of the society should recognize the necessity of local cooperation. Locals should be enabled to check the government and private company management in order to increase good governance. Laws and penalties should apply to all entities lacking in good governance. The study found that the more that locals have participation in the setting up and operation of power plants, the fewer protests there will be.

Environment and Economy

Both Indonesia and Japan have environmental laws to support the operation and management of power plants but law enforcement in Indonesia is weak and license complications exacerbate the problems. These problems reduce the quality of life of local people. One issue is that the locals sometimes do not realize that pollution is a long-term problem. This causes conflict later in the form of protests. Long-term social problems can be the result. In order to avoid these problems, power plant management should include local participation.

In Japan, law enforcement as well as penalties to concession companies are very strong. However, the researcher noticed that as the companies pay a lot of taxes and these taxes become a benefit to the communities, for example a library or a meeting hall, or in subsidies for local projects, the companies earn the trust and support of locals.

Mental and Social Relations

In my short time living among people who work on environment and renewable energy promotion, I found that Japanese people place great importance on the concept of "time". If somebody makes one lose time, this is a great disturbance. In addition, there is a very good public transportation system in Japan. The Japanese lifestyle necessitates a large usage of electricity. In contrast, people in Indonesia often feel that people need only basic amounts of electricity to serve their daily life, like light for reading and working. Many people live agricultural lives in rural areas, and also depend less on electricity. Electricity consumption is much less than in Japan.

Japanese people also place great importance on 'harmony' and "unity" and people often do not dare to express their opinions or their frustrations. This creates stress for those who must conceal their opinions. For example, a teacher in Fukushima would like to move after the disaster but cannot move out because this would make students feel bad. Lots of people in Fukushima would like to move but cannot because of opinions that will

condemn them as bad people who do not care for the community. This also affects their expression of opinions about the nuclear power plant.

Regarding the opinion of people about the environmental effects of CO_2 emissions from power plants, people of both countries agree with policies to decrease emissions and are confident that the improvement of technologies in renewable energy will be a better solution in the long run than building more CPP which release lots of CO_2.

NOTES

[1] Conventional power plants (CPP) include large-scale power plants which use fossil fuels (e.g. oil , natural gas, and coal), nuclear power plants, and huge hydropower dams.

[2] New renewable energy is generated through renewable sources or abundant materials available to local communities. They include solar PV, wind power, biomass and micro hydropower plants

[3] http://www.guardian.co.uk/news/datablog/2011/jan/31/world-carbon-dioxide-emissions-country-data-co2. (Accessed February 1, 2012)

[4] [Organization for Water Maintenance of Ged river] (OPAKg)

[5] http://www.eia.gov/cabs/japan/Full.html, access on 21 July 2012

[6] http://www.guardian.co.uk/environment/datablog/interactive/2012/jun/21/world-carbon-emissions-map, access on 12 September 2012

[7] http://www.indexmundi.com/map/?v=81&r=as&l=en access on 12 September 2012

[8] Interview: Mr. Ban Hideyuki, Co-Director of CNIC. 18th May 2012 and Kiko Network Kyoto,14 June 2012

[9] http://mainichi.jp/english/english/newsselect/news/20120728p2a00m0na012000c.html

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