Improving Rural Electrification in Eastern Indonesia through Institutional Capacity Development

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Sangaji Budi Utomo
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Members of the Examining Committee:

Dr. Sunil Tankha

Dr. Sylvia Bergh

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Inquiries:

Postal address:

Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

Location:

Kortenaerkade 12
2518 AX The Hague
The Netherlands

Telephone: +31 70 426 0460
Fax: +31 70 426 0799

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List of Acronyms

NGO	Non-Governmental Organization
PLN	*Perusahaan Listrik Negara* (State Owned Electricity Company)
BPS	*Badan Pusat Statistik* (Central Statistics Bureau)
MEMR	Ministry of Energy and Mineral Resources
PV	Photovoltaic
SHS	Solar Home System
MHPP	Microhydro Power Plant
APBN	*Anggaran Pendapatan dan Belanja Negara* (State National Budget)
APBD	*Anggaran Pendapatan dan Belanja Daerah* (Regional Budget)
IPP	Independent Power Producer
BUMD	*Badan Usaha Milik Daerah* (Local Government Owned Enterprise)
DGE	Directorate General of Electricity
DAK	*Dana Alokasi Khusus* (Special Allocation Fund)
FIT	Feed-In Tariff
DGNREEC	Directorate General of New, Renewable Energy and Energy Conservation
KLP	*Koperasi Listrik Perdesaan* (Rural Electricity Cooperatives)
GEF	Global Environment Facility
UNDP	United Nations Development Program
ADB	Asian Development Bank
DG	Decentralised Generation
BPPT	*Badan Pengkajian dan Penerapan Teknologi* (Agency for Assessment and Application of Technology)
MoU	Memorandum of Understanding
PPP	Public Private Partnership

Abstract

Recently, there is a distinctive gap in rural electrification in Eastern Indonesia. Common perspective on rural electrification tends to recognise lack of Government financial ability and private sector absence as the influencing factor of the gap. Nonetheless, rural electrification program is also related with the institutional settings. Therefore, concerning the gap in rural electrification in Eastern Indonesia, this research attempts to elaborate on how institutional capacity determines the rural electrification program. It compares three cases that represent flop discontinued project, successful ongoing project, and prospective program. It tries to find which element of institutional capacity that can be developed for other rural electrification program in the future. This research paper recommends cost-sharing arrangement that can create the system of incentives to relevant stakeholders as an institutional capacity element to be promoted.

Relevance to Development Studies

Evidences show that electricity brings particular benefits to rural inhabitants. In terms of health, electricity enables appropriate storage of medication and vaccines in public health facilities and better preservation of food in home. In terms of education, electricity improves school performance since the student is able to study in the evening. In terms of economic growth, rural electrification is important conditions for rural business that encourages economic growth in rural areas through, for instance, more productive small home business. However, rural electrification is often left aside by the Government, especially in developing countries, since it usually requires a lot of finance which the Government find it difficult to cover. In the similar vein, private firms also consider rural electrification as less attractive since it is less profitable. Moreover, rural electrification projects sponsored by donors and NGOs are sometimes not sustainable. This situation leads to the gap of electricity access between rural and urban inhabitants.

Keywords

Rural electrification, institutional capacity, rules, information, communication, cost-sharing arrangement, enforcement, monitoring

Chapter 1
Introduction

A. Research Problem

Discussing rural electrification in Indonesia, firstly, it is necessary to question where the problem comes from. Does it really emerge from the people living in rural areas? Or, rather, is it problematized by the state's policy maker, the market, civil society organisation or even international donors? To answer, it needs to look back to the early period of rural development program in Indonesia when a Government top-down program named the Green Revolution was promoted to increase agricultural productivity in the late 1970's (Welker 2012). Since then, rural development projects in Indonesia are mostly initiated based on Indonesian Government officials and NGOs' perspective on particular issues, and accepted by villagers as […] "the best they can hope for under current system" (Li 2015: 6). So, rural electrification issue might be a result of problematizing the situation by actors from outside rural areas. Nonetheless, since in Indonesia there is no effective framework to catch the real needs of rural inhabitants, the policy maker sensitivity becomes very important.

Regarding that, there are some research and evidences to justify that electricity in rural areas can be beneficial for rural community. In terms of health, Komives et al. (2005) explains that electricity enables appropriate storage of medication and vaccines in public health facilities and better preservation of food in home. In terms of education, electricity improves school performance since the student is enable to study in the evening (Khandker et al. 2012). In terms of economic growth, Barnes (2007) reveals that rural electrification is important conditions for rural business that encourages economic growth in rural areas through, for instance, more productive small home business. In addition, Khandker et al. (2013) concluded that village electrification could increase income and expenditure or rural inhabitants. Dinkelman (2008) also explains that rural electrification can increase female employment rate because women in community experience longer home production time and technology. Referring to those possible benefits the rural inhabitants can obtain, it is a benign action for actors from outside rural areas to think about increasing electricity access to the villagers.

In fact, rural electrification is often left aside by the Government, especially in developing countries, since it usually requires a lot of finance which the Government finds it difficult to meet (Haanyika 2005). In the similar vein, private firms also consider rural electrification as less attractive due to its high cost and low potential revenue (Zomers 2003). This situation often creates a gap of electricity access between rural and urban inhabitants.

The problem to be addressed in this research is rural electrification gap in the Eastern Indonesia. To do research on this, it needs reliable data that prominently derive from two different approaches. The data are selected because these are the only reliable data on electrification which are always used as a basis of electricity national policy or rural electrification projects. The first data is the electrified village rate (*Rasio Desa Berlistrik*). In this regard, electrified means that at least one location in the village is connected to PLN (*Perusahaan Listrik Negara*/the

State Owned Electricity Company) grid. The limitation of this data is that it does not show how many households have received electricity. Second, the electrification rate (*Rasio Elektrifikasi*) that is counted by PLN and based on the number of household connected to the electricity grid. This data is mixed of rural and urban households. The limitation is that it does not provide number of households that are located in rural areas.

Nonetheless, despite of the limitations, there is a similarity between the two data above, each of which shows that five provinces with lowest rates are located in the Eastern Indonesia. According to the 'the electrification rate' data (2013), five provinces with the lowest rate are located in the area, as shown in Table 1 below.

Table 1: Five Provinces with Lowest Electrification Rate (2013)

Provinces	**Percentage**
Papua	43.46%
East Nusa Tenggara	58.91%
South East Sulawesi	66.78%
West Nusa Tenggara	68.05%
Central Kalimantan	67.23%

Sources: MEMRa (2015)

In terms of the electrified village rate, five provinces with lowest number are also in the Eastern Indonesia area.

Table 2: Five Province with Lowest Electrified Village Rate (2011)

Provinces	**Total Villages[1]**	**Electrified Villages[2]**	**Percentage**
Papua	3619	1533	39.07 %
West Papua	1438	1196	83.11 %
Maluku	999	977	95.41 %
East Nusa Tenggara	2918	2852	96.16 %
East Kalimantan	1465	1414	96.52 %

Sources: [1]Central Statistics Bureau (BPS) (2014), [2]MEMRb (2014)

Those two electricity data show that Papua is the province where the electrification and electrified villages rate is still under 50%. The East Nusa Tenggara province, another province in the Eastern Indonesia, is mentioned in both of the data, notably as second lowest Province by the electrification rate. Moreover, other provinces with low electrified village rate (West Papua, Maluku, and East Kalimantan) and other provinces with low electrification rate (South East Sulawesi, West Nusa Tenggara, and Central Kalimantan) are also located in this area. So, from the initial review of those two data, it can be drawn that electricity access in Eastern Indonesia's villages much needs to improve.

There are at least two definition of Eastern Indonesia. According to the Government, the Eastern Indonesia covers four provinces in Kalimantan

Islands, four provinces in Sulawesi Islands, East and West Nusa Tenggara, Maluku and North Maluku, and Papua[1]. Other agencies have slightly different definition of the areas. The World Bank, for instance, excludes Kalimantan Islands in its definition about the areas[2]. Nevertheless, Eastern Indonesia is more than a geographical definition. Instead, it is often used to explain the social and economic gap between the eastern and the western part of the country[3]. Regarding that, this research uses the Government's definition since nowadays it becomes a basis of policy making in infrastructure development, including electricity sector[4].

In general, in most developing countries, grid extension to rural areas and remote communities is associated with high investment costs (Scott and Praci 2013). Less electrified villages in Eastern Indonesia are either located in remote islands or isolated mountainous areas. Regarding that, off-grid electricity sources could be an alternative technology to generate power. For small islands in Indonesia, it is prospective to utilise Solar Photovoltaic (PV) and wind turbine due to relatively constant sunlight and sufficient wind speed (Hirsch et al. 2015). For villages that are isolated in the mainland, micro hydro power plant may be feasible to install. However, there are also several issues to develop those off-grid renewable energy sources in secluded rural areas. For example, micro hydro power plant often have maintenance issues, due to the lack of spare parts in local level[5]. Another example, despite of its technical practicality to be installed to households, Solar PV and wind turbines may encounter sustainability of supply issues, and often only the non-poor is able to purchase the devices that is expensive (Cecelski and Unit 2000).

Looking at the variety of available off-grid alternative electricity sources, it is necessary to address how the alternatives are applied in particular projects. However, beforehand, it needs to take a look at the nature of rural areas characteristics in regard with electrification. In rural areas, the demand for electricity is used mostly for domestic purpose in the peak evening hours that lead to the low load factor in rural areas (Zomers 2003). In other words, electricity consumption for productive uses in this area is relatively minimum (World Bank 2008). The supply of electricity for rural areas has always been considered as more costly compare to the supply to urban areas, and therefore, utilities providers unwilling to do business in rural areas (Zomers 2003). In terms of allocation, the benefits of

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[1] Presidential Decree Number 44 Year 2002 on Eastern Indonesia Development Council (Article 3).

[2] The World Bank (2013), *Pembangunan Kawasan Timur Indonesia* (Eastern Indonesia Development). Available online at <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/INDONESIAINBAHASAEXTN/0,,contentMDK:22691552~pagePK:1497618~piPK:217854~theSitePK:447244,00.html> Accessed in 1/10/2015

[3] For example, in education, there are 34.37% of people living in Papua islands and 13.59% in Sulawesi islands are illiterate, compare to only 4.55% in Java islands (BPS 2015).

[4] For instance, the Ministry of Planning uses this definition to formulate the Eastern Indonesia Economic Development Policy (Bank of Indonesia publication 2014) 'Policy Direction and Strategy of Economic Development Acceleration in Eastern Indonesia'. Available online at <http://www.bi.go.id/id/publikasi/artikel-kertas-kerja/kertas-kerja/Documents/Bappenas.pdf> Accessed in 7/10/2015

[5] Ministry of Research and Technology (2010). *Mikrohidro, Iptek Energi Terbarukan yang Belum Optimal Termanfaatkan* (Micro hydro, renewable energy technology that has not been optimally utilised). <http://www.ristek.go.id/index.php/module/News+News/id/6924/pdf> Accessed in 4/10/2015

rural electrification is sometimes captured by the non-poor (Khanna and Rao 2009). Regarding those characteristics, analysing only the cost and benefit of the alternatives may not be sufficient to generate an appropriate recommendation. Besides, there are other criteria that have to be considered, such as sustainability and agency capacity.

Furthermore, it is important to include analysis on institution. When institutions included in public policy analysis, policy work can be improved (Polski and Ostrom (1999). Moreover, recommendations that is generated without adequate assessment on existing institutions will only reconfirm the flaws of old model of technical development projects. According to Fukuda Parr et al. (2002), the flaws of that model is because, instead of building institutions and other capabilities, it tends to apply systems and knowledges created by the donors. Regarding that, concerning the distinctive gap in village electrification in Eastern Indonesia as aforementioned, this research attempts to elaborate on how institutional capacity determines the village electrification projects' performance.

B. Objective

This research paper aims to suggest an institutional capacity development in order to improve electrification rate in villages in Eastern Indonesia by using local alternative energy sources. In the end, this research tries to come up with particular element of capacity that has potential to be replicable to village electrification projects in the future. However, this research paper is not purposed to give one certain suggestion for all situation in national level. It tries to also explain certain condition under which the capacity development may work, based on the case studies.

C. Research Question

The main question of the research is:

What type of institutional capacity can be developed to improve rural electrification program through alternative technology in the Eastern Indonesia?

To elaborate the main question, there are sub-questions, which are:

- What is the current situation of rural electrification in Indonesia?
- What are the rural electrification projects using local alternative energy sources in Indonesia?
- What institutional setting is the key element of the successful rural electrification project?

D. Methodology

This research is conducted by using secondary data sources. The data are collected from the online sources. The sources are various agencies related with the topic. From the Government side, the relevant agencies are the Ministry of Energy and Mineral Resources, the Ministry of National Planning, and the Ministry of Finance. The data from the Government, are mostly used to analyse formal institutional framework and state agency capacity. This research also uses academics journals that analyse rural electrification, either on its general facts or specific cases in Indonesia. The journals are used to look at alternatives technologies, contexts and case studies. This research also uses NGO and international donor reports. The reports are used to review related agency capacity and projects implementation.

This research paper is conducted by using qualitative method. To investigate the institutional capacity of rural electrification in Indonesia, this research analyses relevant case studies. Narrative on the cases is crafted by reviewing secondary data, mostly academic journals, as well as NGO reports and Government publication. Three cases is selected due to different consideration. The first case, the discontinued Solar Home System (SHS) Project, is investigated to see why its institutional settings failed to encourage the project to meet its objective and what institutional capacity is lacking in this project (Loh 2010, Martinot et al. 2001). The second case, the ongoing Cinta Mekar Microhydro Power Plant Project, is selected because it is reported as a successful project with interesting community participation and financing scheme (Sovacool 2013, Tumiwa and Rambitan 2010). The third case, the just started Sumba Iconic Island, is selected because it is executed in the Eastern Indonesia and the Government optimistically consider as a prospective model for the future[6]. Furthermore, it is also chosen to see what kind of institutional capacity can be developed to make the project perform better.

Findings from the case studies are then evaluated to reveal under which setting the program works, in which setting it flaws, and what capacity may be developed for the future project. In order to assess the institutional capacity, this research uses a framework initiated by Blomquist and Ostrom (1999). They provide five capacity elements of institution that needs to be investigated to find resolution to deal with common problems. The elements are information, communication, cost-sharing arrangement, enforcement and monitoring. To reach the conclusion, this research compares those institutional elements of the three cases by using criteria mentioned by Blomquist and Ostrom (1999) and Blomquist et al. (2010).

[6] Directorate General of New, Renewable Energy and Energy Conservation (2015). *MESDM Pantau Sumba Iconic Island* (Minister of Energy and Mineral Resources Visited Sumba Iconic Island). Available online at <http://ebtke.esdm.go.id/post/2015/04/07/824/mesdm.pantau.sumba.iconic.island>. Accessed in 4/10/2015

E. Scope and Limitation

Scope of this research is mostly about rural electrification in Indonesia. Despite it uses problem in Eastern Indonesia as a basis, two from three cases analysed are from the other part. It is because, firstly, this research tries to see whether there is any institutional capacity of the successful project in other areas is possible to be applied for the future rural electrification projects in Eastern Indonesia, and also to get a lesson learnt from failed case. Time range of this research is from the rural solar energy project commenced in the end of 1990s decade to recent days.

Regarding the data collection, it is sometimes difficult to find required secondary data about actual situation in the arena through internet research due to unavailability of the report or less convincing in relation with sources credibility. In regard with methodology, it is noticed that doing case study research using secondary data might not be able to catch all actual features of the arena, so, this research tries to gather only relevant and credible sources to avoid misinterpretation of the situation. Relevance means its relations to the topic and credibility in this case refers to the researcher, reporter, or organisation status to the project, as well as the methodology in conducting research for academic journals.

F. Organisation of the Paper

To answer the research question, this paper is organised as follows: Chapter 1 is Introduction section. It contains elaboration of the research problem, the research objective, the research questions to answer, the methodology, the limitation of paper and how the paper organised. Chapter 2 is the analytical framework. This research employs institutional capacity approach to address the problem. Chapter 3 is about current situation of rural electrification in Indonesia, which contain regulatory framework, financing, tariff and subsidy regime, and stakeholder mapping. Chapter 4 narratively presents three case studies and a glance of rural electrification alternative technology. Chapter 5 analyses institutional capacity and its comparison based on the findings. Lastly, chapter 6 is the conclusion part that emphasises the research result and suggest certain recommendation.

Chapter 2
Analytical Framework

Institutional Capacity

Institution can be defined as sets of working rules that are used to determine behaviour of agency in terms of actions, decisions, aggregation rules, procedures, information and payoffs (Ostrom 1990: 51). Working rules is distinguished into formal rules such as regulation, legislation and court decisions, and operational rules that implies the actual rules in the arena. Polski and Ostrom explain three levels of rules (Polski and Ostrom 1999: 19, Ostrom 1990: 52). The first level is the operating rules which affect participants' action in day-to-day decision making in certain economic and political settings in regard to when, where and how to get resources, who should do monitoring to the activities, and what information must be shared or kept. The second level is the collective-choice rules, which indirectly affect day-to-day decision making activities by determining actors that is eligible to involve and operating rules that may be changed. The third level is constitutional rules, which decide which actor is eligible to participate in creating collective-choice rules and how the rules may be changed. This research paper analyses more on the first level.

Institution is source of authority, either formal or informal, that structure repetitive interactions of agency and groups (Willems and Baumert 2003: 11). Agency behaviour is shaped by incentives that institution created (Polski and Ostrom 1999: 5). The behaviour produces observable patterns of interaction. The interaction of agencies brings complexity to the policy situation. Regarding that, this research paper examines the interaction among actors that can be seen in the case studies.

Regarding policy situation, to make particular policy successfully applied, Polski and Ostrom (1999) suggest that there is a need to understand the information, the incentive structures and the policy setting. To govern policy situation, there is an institutional arrangements that are created by individuals and groups to removing uncertainty and decreasing risk by making interaction more predictable (1999: 5). Hence, to improve access to public utilities, institutional arrangement sometimes needs to be changed through developing certain capacity.

Capacity is often defined as the ability to execute functions, set and achieve objectives, as well as solve problems in an effective, efficient and sustainable way (Fukuda-Parr et al. 2002: 8, Grindle and Hilderbrand 1995: 5). Parr et al. added that there are three levels of capacity development, which are individual, institutional, and societal (2002: 9). The author argues the developing countries cannot only enhance individual capacity, but rather develop institutional and societal capacity because opportunities and incentives of people have to be improved (2002: 9). In addition, ignoring local existing capacity is often assumed as one factor that causes national capacity development has been unsuccessful, failed to be implemented and the problems remain. Instead of building institutions and other capabilities, technical cooperation on capacity development tends to substitute local alternatives with systems and knowledge created in other areas

brought by the donors (Fukuda-Parr et al. 2002: 5-8). Regarding that, this research tries to relate the analysis into local institution, especially in two case studies.

Conceptually, institutional capacity has changed over the years (Lafontaine 2000, Willems and Baumert 2003). According to Willems and Baumert (2003), nowadays institutional capacity tend to put broader attention on empowerment, social capital, and an enabling environment, as well as the culture, values and power relations that influence agency (2003: 10). It is developed from the initial concept of institutional capacity which only focused on building organisations in technical and management training. Recently, it is divided into individual, organisation and institutional context, which each level has different capacity to develop. In the individual level, it is skill and performance. In the organisation level, it is management capacity, and in the institutional context, it is networking capacity in national level, the regulation and public sector settings, and social norms, values and practice (2003: 11-15).

Blomquist and Ostrom (1999) mentioned types of institutional capacity that can be developed to resolve a common problem. In this context, common problem is characterised […] "by the deterioration, overuse and erosion of the resource's ability to continue to provide the valued use-units" (1999: 61). Capacity to be intervened, according to them, includes information rules, communication, cost-sharing arrangement, enforcement and monitoring.

Information rules is required in the absence of complete information. The good information rules means that an existing institutional arrangement can be invoked by the participants or group of participants […] "to aid them in finding information about the problem" (Blomquist and Ostrom 1999: 65). Information gathering may be started by the participants themselves, but in an absence of information rules, individuals may be excluded. In addition, according to Ostrom et al. (1993), the lack of time and place information has been a reason for the missing of sustainability in many rural infrastructure projects.

Communication condition means two dimensions: dissemination of information to the users and discourse among the actors about their shared problem. According to Blomquist (2010: 631), good communication rules can be seen from the availability of forums to communicate about information and its implications. In other words, it is more than just an information dissemination activities, instead, it is a forum conducted in two way communication. Without it, an information-gathering process will not be translated into resolution. Moreover, the discourse among actors raised in the forum is important as a basis to create strategy and to maintain commons-sharing arrangement. It is indeed the communication will neither be perfect nor costless. However, when imperfect forum that provides information sharing and accommodate users' interaction exists, there is a possibility of improvement (Blomquist and Ostrom 1999: 66-67).

Cost-sharing arrangement is necessary because any resolution of common problems require costs. Then, the issue of cost-allocation appears. Allocation of costs is related with the distribution of interests among the actors. Institutional capacity is required to develop cost-sharing rules that contribute to the structure, provide resolution to the problem and accepted by the stakeholders as being equitable (1999: 67). The good cost-sharing arrangement can be seen from the cost-sharing formula that is accepted by actors as being equitable (1999: 69).

Enforcement rules are important to establish a system that prevent particular actor defect the agreement when others actors cooperate. Existence of institution that is able to effectively enforce the agreement can substitute the cost of using private enforcement. Institutional capacity for the creating and enforcing the agreement needs to be developed to eradicate problems related with private-enforcement approach (1999: 68). The adequate capacity of enforcement rules can be seen from the availability of enforceable and contingent contract (Blomquist et al. 2010: 632).

Monitoring arrangement is important because the perfect and costless monitoring do not naturally exist. It needs to know whether stakeholders can develop an institutional capacity that provide adequate monitoring to deter defection and give consequences to those who do. To conduct effective monitoring action, outside monitor appointment is also appropriate option to help overcoming time-consuming issues of internal monitoring activities (1999: 68). The institutional capacity of monitoring is appropriate when the institutionalised means to conduct the monitoring activities is trusted by the actors (2010: 632).

To assess institutional settings, it is necessary to understand the goods' characteristics (Polski and Ostrom 1999: 10). There are four types of goods. It is public goods when it is neither excludable nor rivalrous, and it is private goods when the goods is both excludable and rivalrous. There is also common pool goods, which is not excludable but rivalrous, and toll goods that is excludable but not rivalrous. Electricity supply can be seen as either public or private goods. When it is used to light public spaces or street it is a public goods, however when it is used for domestic purposes, such as home lighting or cooling, it is a private goods. Because the nature of electricity provision is that when it is consumed by one user it is unavailable to others, and it can exclude users from the service, the electricity supply is often categorised as a private goods (Scott and Prachi 2013: 6). However, in particular case where the power plant belongs to community, there is a nature of common pool goods, since it does not exclude any users, but one user's consumption closes opportunity of the others, given that power capacity is limited.

Chapter 3
Current Situation of Rural Electrification in Indonesia

A. Regulatory Framework

In Indonesia, there is a hierarchical division of regulation. The Constitution is the highest regulation. Under the Constitution, there is the Law (*Undang-Undang*) that is stipulated by the Parliament together with the President. Under the Law, by hierarchical order, there are the Government Regulation, the Presidential Regulation and Decision, and the Ministerial Regulation and Decision. Generally, lower its position in the hierarchy, the regulation arranges on more specific issue.

In regard with information rules, there is a Law that regulate the openness of Public Information (*Informasi Publik*)[7]. *Informasi Publik* is defined by the Law as an information related with state or public administration which belong to Public Organisation (*Badan Publik*). Rural electrification projects are often organized by *Badan Publik*. It is defined by the Law as executive body (of the Government), and other organization which have the task and role related with public administration, including non-governmental organization as long as using the State National Budget (APBN) or the Regional Budget (APBD)[8]. For the *Badan Publik*, there is an obligation to provide information regarding the projects to the community, and the community have rights to obtain, sue and request for certain information[9]. In other words, when the rural electrification projects are funded with government budget, the administrators (can be government's unit or an NGO) has an obligation to open information to the users.

In regard with communication arrangement, there is no Law or Regulation that specifically regulate methods of information dissemination or establishment of discussion forum regarding service provision or production activities. However, in the newly enacted Law number 6 Year 2014 on "Village", there is a meeting forum named *Musyawarah Desa* that is established as a platform to discuss strategic issue in the community[10], which includes village planning, cooperation and future investment plan[11]. In addition, it is stated in Law Number 14/2008 that every individual have rights to attend public meeting to obtain public information[12]. Given that the platform and rights exist, there are no regulatory constraint to the rural electrification project administrator to conduct information dissemination meeting as a way to communicate.

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[7] Law Number 14 Year 2008 on Public Information Openness (*Keterbukaan Informasi Publik*). Available at <http://www.bkn.go.id/wp-content/uploads/2015/06/UU-Nomor-14-Tahun-2008.pdf> Accessed in 2/11/2015

[8] Law Number 14 Year 2008, Article 1

[9] Law Number 14 Year 2008, Article 4 and 7

[10] Law Number 6 Year 2014 on Village, Article 54, Point 1

[11] Law Number 6 Year 2014 on Village, Article 54, Point 2

[12] Law Number 14 Year 2008, Article 4 Point 2

Regarding cost-sharing arrangement, the regulation obligates the Central and Local Government to provide fund for rural electrification. It is stated in the third point of Electricity Law Number 30 Year 2009 Article 4, which is: "*With respect to electricity supply as mentioned in Article 3 Point (1), the Central and Regional Government provide fund for: (a) Poor community groups; (b) The development of electricity supply facilities in less-developed regions; (c) The development of electricity in remote and borderline areas; (d) The development of rural electricity"*. In the Law, there are no further Article that specifically regulate other actors' role in electrification funding. However, if private sector and civil society organisation participation in the arena can be meant as availability of finances, it is possible by the Law for these actors to involve under Government licensing[13].

For enforcement and monitoring rules, there is no regulation that specifically arrange these element of institution. Enforcement rules arrangement based on the contract made by the actors. Monitoring rules are most likely related with agreement among the actors. However, for the project that use government's budget, there is an obligation to report its utilisation to the state audit agency.

Regarding actors, in general it is mentioned in the Article 4 of 2009' Electricity Law. In the point (1), it is stated that implementation of electricity supply business, both in central and local level, shall be done by the State-Owned Enterprises and the local government owned enterprise (LGOE). In the next point, it is stated that private enterprises, cooperatives, and civil society are allowed to involve in electricity supply business.

In relation with local alternative technology, in the Law Number 30/2007 on "Energy", it is stated that the Local Government, together with the Central, must increase provision and utilisation of new and renewable energy. In the Article 20, it is mentioned that "*energy provision by the Central and/or Regional Government is prioritised for underdeveloped, remote and rural areas with a priority to use local energy source, especially renewable source*".

In regards with electrification project, according to the Presidential Regulation number 36/2010, there is an obligation for private firms in a less than 10 MW plant to operate in partnership with local Small Enterprises and Cooperatives. Regarding its sales, there is an obligation for PLN to purchase electricity product from any other producer with a capacity below 10 MW and the excess power generated by IPPs, LGOE, NGO, or Cooperatives[14].

From the regulatory framework, it can be seen that there are no regulation constraint to develop the elements of institutional capacity. Instead, regulation on communication and information elements gives opportunity to the community to obtain relevant public information as well as enables a forum to discuss certain village issues. In addition, obligation for the government to provide fund for rural electrification and PLN to purchase electricity produced by small power plant implies that at least the Government is formally able to join cost-sharing for the projects. Subsequently, to see further into the current situation of the electricity sector, it needs to look at financing, tariff and subsidy regime to reveal how rules on these features affect the actors.

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[13] Electricity Law Number30/2009, Article 4 and 5

[14] MEMR Regulation Number 31/2009 on PLN Purchasing Price on Power Generated by Small and Medium Renewable Energy or Excess Power.

B. Financing, Tariff and Subsidy Regime

Rules on financing, tariff and subsidy is reviewed to reveal the current rural electrification program settings. Understanding on this matter is important to identify which actors are nowadays dominantly presence in rural electrification program and, furthermore, whether its capacity is enough to implement the project.

1. Recent Financing Sources

Nowadays, the Government's fund still becomes the most important sources to finance rural electrification. The fund is allocated through two schemes, the National Budget Allocation that is given to the MEMR and PLN, and the National-Local Government transferred fund. In the 2015 National Budget Plan revision, the budget allocated for rural electrification program is Rp 3.1 trillion (approximately US$ 326.1 million)[15]. This budget will be used through PLN by expanding the conventional grid. Table 3 below shows the budget allocation for five provinces with lowest electrification rate.

Table 3: Rural Electrification through Grid Extension Plan for 2015

Provinces	Network Plan (Km)	Total Budget
Papua	296.82	Rp 159.82 Billion (US$ 16.82 Million)
West Papua	198.72	Rp 122.70 Billion (US$ 12.91 Million)
Maluku	196.28	Rp 94.72 Billion (US$ 9.97 Million)
East Nusa Tenggara	347.11	Rp 163.61 Billion (US$ 17.22 Million)
East Kalimantan	200.37	Rp 129.78 Billion (US$ 13.66 Million)

Source: MEMRa (2015: 125-126)

However, according to the Director of Program Supervision at the Directorate General of Electricity (DGE), the program has to encounter various potential challenges, among others are licensing the grid construction that crosses protected forest area, land acquisition, technical difficulty to access locations, and lack of supporting infrastructure[16]. In consequence, the budget may not totally be utilised in the first year. It indicates that the Government capacity to absorb the fund is lacking.

In addition, there is also a scheme named the Special Allocation Fund (*Dana Alokasi Khusus*/DAK). It is transferred fund from the Central to the Local Government which can only be used for infrastructure development. Since 2009' Electricity Law enacted, in which the regional authorities have an obligation to provide fund, there are trillions of rupiah budget has been earmarked through

[15] All the currency convertion uses rates US$ 1 = Rp 9500

[16] Published on the DGE official website (6 May 2015). Sekilas Tentang Program Listrik Perdesaan (*A Glance on Rural Electricity*). Available online at <https://www.djk.esdm.go.id/index.php/detail-berita?ide=3894> Accessed in 16/7/2015

DAK. The table 4 below shows the DAK for rural electrification during the last five years since the establishment of the Law.

Table 4: Allocated DAK for Rural Electrification (2009 – 2014)

Year	Total Allocated DAK for Rural Electrification
2010	Not allocated
2011	Rp 150 billion (US$ 15,8 million)
2012	Rp 190,6 billion (US$ 20,1 million)
2013	Rp 432,5 billion (US$ 45,5 million)
2014	Rp 647,9 billion (US$ 68,2 million)

Sources: Ministry of Finance (2010, 2011, 2012, 2013, 2014).

From the table, it can be drawn that funds allocated for the local government to enhance rural electrification has been growing significantly during five years. However, despite of the transfer, the Central Government still holds the control and leads the direction because the implementation and the amount of fund is determined by the Central Government[17]. According to Deravajan et al. (2009: 103), it may lead to a 'governance trap', a situation where local agency capacity is not improved.

Regarding financing, there are a few examples on rural electrification financing institution from other country. In China, the Government plays dominant role in financing rural electrification despite of its multi stakeholder engagement. According to Liming (2008: 5-6), rural electrification program with renewable energy is funded, implemented and supervised by the Government under program named Send Electricity to Townships' which has electrified more than 1000 townships in western part of China in two years of implementation. To compare, Chile has different story. The Government of Chile invited private firms to the project by providing subsidy for investment costs which is less than net present value of the project. According to Jadresic (2000), during the first five years of implementation since it was started in 1994, the Central Government had given the subsidy to attract investment in rural electrification. The company spent no less than particular amount of costs that was calculated with a formula decided by the Central Government. As for the consumers, they need to pay for domestic wiring cable, the electric meter, and the coupling for the grid which approximately costs no more than 10% of the cost of each project (2000:4-5). The examples show that different financing institutions work under particular country context. In China, which the State has a full control of its economic development, the program would be implemented effectively under the Government direction and control.

[17] Minister of EMR Regulation Number 03/2014 on Technical Guidelines for Special Allocation Fund on Rural Energy For Year 2014

2. Tariff and Subsidy Regime

Electricity tariff and subsidy is determined by the Central Government. The selling tariff is differentiated into several classes: the public services, households, business, government connections and industry. The lowest tariff for households (November 2014) is Rp 169 (around US$ 0.02)/kWh for those who have less than 450 VA of power with 0-30 kWh of consumption. The highest tariff is Rp 1352 (around US$ 0.14)/kWh for households with more than 6,600 VA of power[18]. The tariff structure implies the degree of consumption of the user. Lower tariff means lower electricity capacity installed in households which shows its possible degree of consumption.

Given that PLN generation cost outside Java-Bali and Sumatera connection is above Rp 1500 (US$ 0.16), there is a gap between it and tariff mentioned beforehand. The gap becomes much wider for some regions in Eastern Indonesia (Papua, Nusa Tenggara and Maluku islands, West Kalimantan) where the average generation cost is above Rp 2500 (US$ 0.28)[19]. To cover the gap, the Government provide subsidy[20]. Recently, subsidy in electricity sector is targeted to consumer through PLN. In 2014, the total subsidy was Rp 103.8 trillion (US$10.9 million)[21]. The recent Government has a plan to cut the subsidy for 450 and 900 VA (low and middle) consumer and reallocate it. Instead of subsidising PLN, the budget will directly be given to the poorest and being spent for infrastructure project[22]. In regard with rural electrification, the raising price of the lowest tariff class will give more burden to the consumer in the village, given that they have lower ability to pay compare to the consumer in urban areas (Schmidt et al. 2013:592).

Given that the tariff set by the Government is lower than the cost of generating electricity with off-grid renewable energy technology, the Government apply the feed-in tariffs (FIT) policy to encourage investment. FIT gives a guarantee of payments per kWh for the system's output for a period of time (Cory et al. 2009: 2). The anticipated benefit of FIT is that the payments can be designed to give appropriate rate of return for investors (2009: 2). The FIT policy is expected to create a 'market-friendly' environment for renewable energy generation. However, in practice, it might have to deal with difficulties in setting the appropriate tariff rate in order to give guarantee that the project cost can be covered by the

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[18] Minister of Energy and Mineral Resources Number 31/2014 on Electricity Tariff provided by PLN.

[19] Presentation by Rudolf Rauch (2013), the Program Director of GIZ Indonesia. Energy and Rural Electrification Policies in Indonesia: Market Potential for PV-Hybrid System. Available online at <https://www.giz.de/fachexpertise/downloads/giz2013-en-rauch1-pep-workshop-indonesien-pv-hybridsysteme.pdf> Accessedd online at 3/11/2015

[20] Publication in DGE Website (2014). Certain types of subsidy reduction through electricity tariff adjustment. Available online at <https://www.djk.esdm.go.id/index.php/layanan-info-pub/tarif-tenaga-listrik> Accessed in 3/11/2015

[21] Kompas* (2014) *DPR Setuju Subsidi Listrik 2014 Rp 103,8 Triliun* (Parliament Agreed on 2014 Electricity Subsidy of Rp 103.8 trillion). Available online at <http://bisniskeuangan.kompas.com/read/2014/06/13/1832031/DPR.Setuju.Subsidi.Listrik.2014.Rp.103.8.Triliun> Accessed in 7/10/2015. *Kompas is one of the leading newspaper in Indonesia.

[22] Bloomberg (2015) Widodo to switch off middle class power subsidy in budget reform. <http://www.bloomberg.com/news/articles/2015-06-16/widodo-to-switch-off-middle-class-power-subsidy-in-budget-reform> Accessed in 7/10/2015

revenue. Regarding that, FIT policy requires a periodic revision as a response to changing costs and market conditions (Cory et al. 2009: 11).

Looking at the recent financing source and subsidy given to the consumer, the success of national rural electrification program implementation relies on the Government ability to execute. Besides, the FIT policy can also be seen as Government effort to invite private sector to the program despite of the uncertainty issue that may emerge in the future. Hence, the Government capacity is crucial in current national rural electrification program settings. Yet, rural electrification program is not only related with the Government. Instead, there are several other actors participate in the program.

C. Stakeholders Mapping

Stakeholders participate in rural electrification in Indonesia among others are the Central Government, Local Government (Provincial and Regency), NGO, private companies, donors, and communities. The roles, interest and resources, as well as the experience in rural electrification is different among one and other actors.

1. Central Government

Central Government agency who is responsible to manage and regulate energy sector is the Ministry of Energy and Mineral Resources (MEMR). Under MEMR, there are the Directorate General of Electricity (DGE), who manage electricity sector including rural electrification, and the Directorate General of New, Renewable Energy and Energy Conservation (DGNREEC), responsible for renewable energy. These organisation's roles are to formulate, implement policy and provide technical standardisation in electricity and renewable energy field. MEMR has also roles to draft the Strategic Plan which is renewed every five years. Regarding rural electricity, MEMR set the target, create plan, propose and allocate budget, and encourage PLN in implementation, supervise the program, as well as coordinate all relevant stakeholders[23]. Nonetheless, in practice, there are challenges to deal with, such as the coordination, budget limitation and technical issue in implementation.

MEMR interest to rural electrification is high. MEMR has set target to achieve 85% of national electrification rate in 2020. Therefore, rural electrification program as a part of it has become more important to be concerned. The target is set to follow recent President's focus on infrastructure development. The newly elected president has changed the National Budget of 2015 to give more emphasize on infrastructure projects. Revised version of 2015 national budget shows that the Government increases its fund allocation for ministerial investments

[23] Law Number 30 Year 2009 on Electricity

and infrastructure projects[24]. It includes fund for rural electrification project trough expanding the conventional grid as shown before in Table 3.

In terms of power, Central Government has very strong position in the sector, formally. It is because of the full control that has been mandated to this organisation by the Constitution, Law, and other derived regulations in conducting the sector, from formulating policy to supervising the business. For example, in the 2009 Electricity Law, Article 3 Point (1), it is mentioned that "*the electricity supply provision is controlled by the State which its implementation conducted by the Central and Local Government based on the principle of regional autonomy*". The State's strong appearance based on the idea that the electricity is one of the necessary and strategic production activities in "national life", therefore it should be under control of the State which its activities are for "the optimum interest and prosperity of the people" as regulated by the Constitution of the Republic of Indonesia[25]. In practice, it has to bargain with private sectors in electricity sector that has financial capital the Government need to build the generation plant. Government resources is the budget. However, to finance all the electricity projects, it can only cover half of the estimation cost[26].

2. Local Government

Formally, Local Government, both in provincial and regency level, is responsible in conducting electricity at local level. After 2009 reform, Local Government received some of responsibilities which previously in the hand of the central government. The responsibility includes formulating regional electricity policy and plan, issuing supply business and operation licences, and setting tariffs for their appointed electricity supplier, as well as supervising power supply business in local level[27].

In regards to rural electrification, local government's interest is high. Electrifying rural areas is related with their accountability as public administration organisation in the regions. However, in the field, the Central Government through PLN is still very dominant. Local Government still relies on the Central Government and PLN plan to electrify their regions[28].

In terms of power and resources, after decentralisation era, Local Government has an authority to decide their needs and to include it into their development plan. However, some Local Governments do not have enough resources to provide fund for infrastructures by itself. Therefore, allocation from the National

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[24] President statement as published in the Jakarta Post Online (2015) 'No more hot air on infrastructure: Jokowi'. Available online at <http://www.thejakartapost.com/news/2015/04/30/no-more-hot-air-infrastructure-jokowi.html> Accessed in 29/6/2015.

[25] Article 33 Point 2 of Indonesian Constitution mentions that "Sectors of production which are important for the country and affect the life of the people shall be under the powers of the State".

[26] Total installed capacity required to electrify the entire country is 96,524 MW. To finance this program, the Government will only provide invest 18,420 MW in 232 units. The rest will be covered by private firms' investment with 24,510 MW in 260 generation units (MEMR Strategic Plan 2015: 124).

[27] Law Number 30 Year 2009 on Electricity

[28] See pages 13 on financing section

Budget is still required. The 2009' Electricity Law actually open the opportunity for the Local Government to manage their own electrification program through Local Government Owned Enterprise (*Badan Usaha Milik Daerah*/BUMD). Nonetheless, until recently, BUMD's contribution is barely exist.

3. State Owned Enterprise

Another key actor in Indonesian electricity sector is the only State Owned Enterprise operating in power supply business, PLN. Founded in 1965, PLN has become a dominant actor in the sector since they had been given mandate to provide electricity to the entire country in 1972. After the first electricity reform took place in 1985, PLN's role was still very dominant. Despite of opportunity given to IPP to be involved, PLN still held responsibility to electrify the country. PLN is the only party that can sell directly to the consumer, until now. It had also been the actor who issue license for the other entities to participate in the business. After 2009' law enacted, PLN appearance in the sector is still dominant. There are indeed some roles that are now shared with the other stakeholders, such as in licensing, which has been divided to the central and local government. However, PLN still receives important privileges in regard to rural electricity, such as a priority given to provide electricity for public utilities[29] and to install electricity in particular areas on which other actors are unable to provide[30].

PLN has its own interests, both in operational and financial. As an enterprise, it requires beneficial amount of revenue. As a State Owned Enterprise, it should be able to provide affordable electricity supply to the people. In rural electrification, it is difficult for PLN to recover high production and distribution costs since the low grid electricity tariff is set to be low due to affordability reason (Blum et al. 2013: 483). Regarding that, PLN has various sources of funding to operate.

PLN has three sources of fund, which are (i) Internal funding; (ii) Loan; and (iii) National Budget Allocation as Government equity[31]. PLN internal funding ability is low. It cannot get the margin from selling the product since the electricity product has to be sold in under its generating and operational costs. In 2009, for instance, all of the PLN investment were funded by Loan. However, in terms of loan, PLN can only borrow in limited amount since there is a limitation of loan covenant which is arranged by lender and bond holder. Consequently, with low financial ability and limited loan, PLN depends on the National Budget Allocation through Government equity.

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[29] 2009 Electricity Law, Article 11 Point 2

[30] Article 11 Point 4

[31] PLN (2015) *RUPTL 2015-2024* (PLN General Plan 2015-2024). Page 150-151. Available online at <http://www.pln.co.id/dataweb/RUPTL/RUPTL%20PLN%202015-2024.pdf> Accessed in 22/08/2015

4. Private Sector

Recently, investment of private sector in rural electricity is low. In terms of off-grid power plant, it is only accounted less than 1% of installed capacity for each types of sources (Blum et al. 2013). Private firms' representatives in rural electrification business is mostly local company, for instance Sewatama which operates in Wind Turbine project in Eastern Indonesia and HIBS in microhydro power plant in West Java.

Private companies are expected to fill the required investment that State is unable to provide. In the total investment estimation to 2024, almost half of the financing of electricity projects is expected from private sector participation. The total costs projected are US$ 132.2 billion. Government, through PLN will cover US$ 69.4 billion, and private firms are expected to provide US$ 62.8 billion[32].

Private firm interest is, generally, maximising profit and accumulating capital. For IPP's to participate in rural electrification, there are some considerations. Large IPP's concern to the high capital and operating costs, as for small IPP's, they have to deal with the lack of resources and are unable to provide track record to get other investors' trusts[33]. According to quantitative research by Blum et al. (2013), there are some factors that influence private sector investment decision. In common, it viewed as less attractive due to low demand, low return rate and high costs. In terms of renewable-energy based villages grid, private sector investment is assumed to be pulled in if there is a potential positive returns generated by the situation. Schmidt et al. (2013: 585-586) suggested that the return streams can be divided into three levels, local, national and international. At the local level, it refers to the willingness to pay of the consumers in rural areas. The willingness to pay is related with income levels, and other factors such as educational levels and kerosene consumption. Schmidt et al. revealed that the average willingness to pay in the local level is lower compared with national level (2013: 592). The second reason is related with investment cost. In addition, there are also investment barriers regarding rural areas characteristics. According to Schmidt et al. (2013: 587-588), the barriers can be from local, national and international level. At the local level, it is claimed to be lack of understanding to the consumer's needs; lack of decentralised operation, maintenance, and administration; unstable electricity demand and uncertain forecasts; lack of skilled human resources; and lack of finance. In terms of financing, Schmidt et al. (2013: 588) explained that firstly, the rural inhabitants have low income levels, secondly, they cannot get financing to start their own small scale electricity project, and thirdly, investors need to set affordable price to make rural electricity sustainable.

Low future revenue, high cost, and particular investment barriers has become factors for the private sector to do not invest in the rural electrification program. Nonetheless, private investment is not only expected sources for the electricity sector development because there are also the presence of communities and donors.

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[32] PLN (2015) RUPTL 2015-2024. Page 152

[33] IBEKA (2013) 'Powering Indonesia's Rural Development Business Plan for Impact Investing in Mini Hydropower'. *A Presentation by IBEKA Director*. Available online at <http://www.global-inst.com/downloads/knowledge-tank/2013-IBEKA-Business_Plan.pdf> Accessed in 27/08/2015

5. Communities

Communities' interests in rural electrification program is high. It is because from the principal-agent perspective, they are the principal of the policy. They are the actor that formally become the focus of the rural electrification program. It can be seen from, at least, the program target that use the electrification rate (the number of households connected to the grid) as an indicator. However, it is often left aside from the process.

Community is often represented by self-operated village Cooperatives. The previous experiences suggested that some Electricity Cooperatives (*Koperasi Listrik Perdesaan*/KLP) finally expanded their business operation and became less accountable to their community in the area it is established. For instance, KLP "Sinar Siwo Mego", by 2011 has enlightened 70,000 household in three regencies in Lampung provinces in southern Sumatra islands[34]. However, lately the services supplied by this KLP received many complaints from the consumer as it often experienced blackout[35]. After long debate about the status of its assets, in 2011, the Lampung Provincial Government revoked the operation license of the KLP. The responsibility to provide electricity is then shifted to the PLN. Similar case has also happened with KLP "Sinar Rinjani" in the West Nusa Tenggara province. From these two cases, the Cooperatives operated in those rural areas failed to provide good quality electricity services. The reason behind this failure is because of its lack of attachment to the consumer (Tumiwa and Rambitan 2010). They mentioned that lack of priority given to local participation, ownership, human resource development, as well as lack of capacity to support project sustainability ended to the failure of the previous projects.

6. International Donors

The 2009' Electricity Law does not regulate the roles of International Donors in financing electricity program in Indonesia. However, the Donors' fund are usually implemented by national or local agency. In the earlier periods of donor's participation, the Government and PLN acted as local planner and implementer. Currently, the Government is no longer exclusive executor of external sources financing stream. NGOs has been taking role to manage donor funds. "Sumba Iconic Island" initiative can be one example. In 2009, a Dutch NGO, HIVOS has initiated a project called "Sumba Iconic Island" Initiative which aims for 100% of renewable electricity in Sumba islands, a small island located in the Eastern Indonesia, as a long term objective.

External financing in developing Indonesian rural electricity has took place since the early of 1970's when mostly the projects are funded with bilateral aid by United States and Canada (McCawley 1978). During the next decade, Australia and Japan financing several PV's projects, followed by Switzerland and Germany

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[34] PLN Lampung (2011) 'Peralihan KLP SSM ke PLN Gratis' (Free PLN Installation for Former KLP SSM Customer) Available online at <http://www.pln.co.id/lampung/?p=441>

[35] Antara News (2011) *'Warga Nilai Jaringan PLN Lebih Baik'* (Citizens See PLN Grid is Better) Availabale online at <http://lampung.antaranews.com/berita/259877/warga-nilai-jaringan-pln-lebih-baik> Accessed in 22/08/2015

that supported micro-hydro development programmes, and Multinational donors such as the World Bank, GEF, UNDP and ADB which were also worked in policy and planning stage (Tumiwa and Rambitan 2010: 10). At the beginning, the features of donor's rural electrification assistance are technological, social, environmental and institutional. Lately, the term sustainability emerges as another key features (Zomers 2003: 73).

Donors' interests in rural electrification is high. It can be seen from the huge fund they have provided for this program. The development assistance is part of the foreign policy of government which is generally understood as an instrument to expand commercial and strategic interest of the countries (Hutchison et al. 2014: 149). Hence, it is important to see whether the fund comes together with the request to use particular technology provided by the company from the donor countries. However, to see how it is related each other, it needs another research. In fact, the countries that provide fund in some rural Indonesia electrification projects have a developed domestic renewable energy industry, such as Norway with hydropower technology and Netherlands with the Solar PV.

From stakeholder identification, it can be seen that the stakeholders have high but different interests on rural electrification. The differences may create dynamics relation among these stakeholders. However, different level of resources can make one actor more dominant rather than the other in the arena. To address this relation, it is important to see what is actually happened when these stakeholders interact in particular projects which will be explained in the next chapter.

Chapter 4
Projects on Rural Electrification Using Alternative Energy Sources

A. The Alternatives

The case studies analysed in this chapter are projects that use alternative technology, such as micro hydro, solar photovoltaic and wind turbine. In Indonesia, currently, rural areas are electrified by both conventional system and the Decentralised Generation (DG). The DG can be defined as […] "the installation and operation of electric power generation units connected directly to the distribution network or connected to the network on the customer site of the meter" (Ackerman et al. 2001: 196).

There are various kind of DGs that appropriate for rural electrification, among others are small hydro, micro hydro, wind turbine, photovoltaic arrays, solar thermal, biomass, fuel cells, geothermal, ocean energy, stirling engine and battery storage. In terms of rural electrification, Lhendup (2008) compares the strengths and weaknesses of those technological options. Using Bhutan as country to analyse, the author concluded that solar photovoltaic, wind turbine, biogas power plant and small water turbine are the most suitable alternatives for Bhutan rural area context due to its availability in the village level (2008: 16). It is indeed one of the main benefit of using the DG as electricity source is that it can be installed in isolated or remote areas (Chakrabarti and Chakrabarti 2001: 37). In terms of Eastern Indonesia context, DG has potential to be installed in the region, especially micro hydro, solar Photovoltaic and wind turbine.

Micro Hydro

In energy sector, micro hydro power is hydropower plant with small capacity. According to Paish (2002), small often refers to hydropower plant less than 10 MW. Policy makers in Indonesia define micro hydro as hydro power plant with size less than 1 MW[36]. To operate, a micro hydro power plant needs a constant supply of water stream to drive the turbines to covert water pressure into mechanical power. Micro hydro potential diffuses across Indonesia where many small river available. The potential is predicted to be about 459.91 MW, but only 4.54% of it (20.85 MW) has currently been generated (Hasan et al. 2012: 2322-2323). It is because at the starting and operational stage, the plant has to deal with certain technical and financing issues. At the starting level, the problem is in the feasibility studies which is not appropriate, so then lead to less accurate

[36] Minister of Energy and Mineral Resources Regulation Number 3 Year 2014 on Technical Guidance of Special Allocation Fund for Rural Energy 2014.

data that affects its reliability[37]. At the operational level, there are technical issue related with plant efficiency, and financing problem related with maintenance cost (Bensch et al. 2011: 48, Budiarto et al. 2013: 516).

Solar Photovoltaic

Solar Photovoltaic (PV) is a technology that produce electricity through conversion of sunlight. Main segments of solar PV are consumers in rural areas, both for home applications and industry, which currently accounts for nearly half of the total PV market (Razykov et al. 2010). As a country located in equatorial line with extensive sunlight, Indonesia has a potential to generate energy from solar PV despite of heavy cloud that cover the sunlight for about 6 months every year during rainy season. According to MEMR Strategic Plan 2014-2019 (MEMR b 2015), the potential can be divided into western and eastern part of the country. Solar energy resources in Eastern Indonesia is 5.1 kWh/m2.day with monthly variation around 9%. Nowadays only 49 MWp has been generated, which accounts for 1% of total potential (2015: 72). One of the main reason is the price that is much higher compare to the subsidised conventional generation. Another challenge is because the potential is stranded in particular areas and cannot be moved to other places (2015: 78).

Wind Turbine

Wind turbine converts wind into electricity. Global wind power capacity in 2009 is around 158 GW with only 24.6 GW installed in Asia (Kaldellis and Zafirakis 2011: 1889). To operate, a wind turbine needs wind speeds of 4 to 5 metres per second (m/s) and to get maximum power output, it needs speeds at around 15 m/s[38]. In Indonesia, in the areas with high potential such as Sumba islands, the highest speed peak can reach around 6.5 – 8.2 m/s (Hirsch et al. 2015). The deployment of the potential is indeed mostly located in Eastern Indonesia. According to the DGNREEC, the highest potential is located in East Nusa Tenggara Province, which accounts for 30,788 MW (MEMR c 2014: 76). The reasons behind the low installed capacity in Indonesia are related with cost, tariff, and technical issues[39]. In terms of cost, the turbine price is expensive, so does the installation cost, but electricity tariff is low. Moreover, despite of the fact that it does not required fossil fuel to day-to-day operate, it is still costly in maintenance due to the location where usually in remote areas and the spare-parts unavailability in rural areas. In addition, the design specification is often not compatible due to less technical assessment and lack of wind data.

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[37] Ministry of Research and Technology (2010). *Mikrohidro, Iptek Energi Terbarukan yang Belum Optimal Termanfaatkan* (Micro hydro, renewable energy technology that has not been optimally utilised). <http://www.ristek.go.id/index.php/module/News+News/id/6924/pdf> Accessed in 4/10/2015

[38] The European Wind Energy Association (2015) Wind energy's frequently asked questions (FAQ) <http://www.ewea.org/wind-energy-basics/faq/> Accessed in 18/10/2015

[39] Presentation of Whypgen-BPPT (2013) 'Wind Energy and Development in Indonesia', Available online at <http://energy-indonesia.com/03dge/0131009furyoku.pdf> Accessed in 4/11/2015

B. Case Studies

There are three case studies to explain actual situation in the arena. The first case is the Solar Home Systems (SHS) Project which was not continued after 4 years since it is started, because the outcomes were failed to meet the target (Dasuki et al. 2001; Loh 2010; Martinot et al. 2001; Miller and Hope 2000). The second case is the Cinta Mekar Microhydro Power Plant Project that has began in 2005 and acclaimed by many academic journals and NGO reports as a success story (Loh 2010; Sovacool 2013; Tumiwa et al. 2009; Tumiwa and Rambitan 2010). The third case is the Sumba Iconic Islands that has just started in 2012, and located in the Eastern Indonesia.

1. Solar Home System Project

The Second Solar Homer System (SHS) Project was started in 1997 by two international agencies: the World Bank and the Global Environment Facility (GEF), as a part of the Government ambitious target to install 1 million solar PV within ten years (Dasuki et al. 2001). The project's objective was to enhance rural electrification and reduce dependency to fossil fuels by creating new market for Solar PV (Loh 2010). The initial target of the project was to install 200,000 units of SHS to the households in four years, 1997-2001 (Dasuki et al. 2001). The initiative came from the loan officer of the World Bank who is responsible for rural electrification loan, in Washington DC (Miller and Hope 2000).

The project was not executed in any specific village, island or region. Instead, it was implemented at "in filling regions", which are defined as village households and small industries with no access to PLN conventional grid but were located in areas that have been included in PLN electrification plan (Dasuki et al. 2001).

The key actors involve in the SHS Project were the donors and private sector, with banks in rural areas and the Central Government support. The World Bank was the initiator and loan provider. GEF provided grant and included the program as part of its mission in reducing emissions from fossil fuels to address climate change (Miller and Hope 2000). The private operators was expected to sell the SHS as much as the target (Loh 2010). The local banks had role to ensure rural SHS costumers could earn credit (Miller and Hope 2000). The Government, through the Agency for Assessment and Application of Technology (*Badan Pengkajian dan Penerapan Teknologi*/BPPT), included the project under a program named 'One Million Rural Solar Home System Program' (Dasuki et al. 2001: 322).

The model developed in the project was a dealer-credit model. It was chosen due to successful experience of one private dealer in West Java a few years before the project began. The dealer, through her/his rural PV energy company, was successfully selling 4000 SHS units in the first year of operation on credit (Martinot et al. 2001, Miller and Hope 2000). The business model extended financing from financiers to dealers, and in turn, dealers extended consumer credit to their buyers, in maximum 4 years terms. The lender banks would bear credit risk of the dealer. The dealer would guarantee credit risk of their buyers (Martinot et al. 2001).

There was also a capacity building activities in the project (Loh 2010). It was a training aimed to develop private dealers' business plans and improve ability to deal with banks for financing, based on consideration that the key constraint in selling SHS was dealer cash flow (Martinot et al. 2001). However, neither capacity building activities was conducted for villagers nor for non-private company was held.

In terms of financing, the World Bank provided soft loan of US$20 million and GEF provided grant of US$24.3 million (Dasuki et al. 2001). The soft loan and grant was transferred to the private sector in order to promote commercialisation of SHS units to rural areas. The Central Government did not expend any budget (2001: 325). All cost of the project were covered by the semi-commercial credit from the donors to encourage market penetration. To attract private sector dealers to the market, the grant from GEF was utilised as […] 'a supply-side subsidy of US$100 per SHS unit installed' (Miller and Hope 2000: 96). The subsidy could cover around 20-25% of the units cost (Loh 2010). However, despite of the subsidy given, take up rate was very low. In the end, it was only 8,054 units were installed (Loh 2010), much lower number compare to the target of 200,000 units.

The unsatisfactory performance was a consequence of several factors from demand side, supply side and external factors. In the demand side, the villagers did not have sufficient fund to obtain the devices. The banks operated in rural areas that were expected to provide SHS consumer credit access could only offer short-term loans with high rates of interest (Miller and Hope 2000). It was not a preferable financing option for villagers. Moreover, there was lack of information about the quality and performance of the product as well as its cost and benefit (Martinot et al. 2001). In the supply side, despite of subsidy scheme, the project was not offered adequate profit for private sector business perspective (2001: 43). Another important factor was that in 1998, shortly after the project commenced, the country was swept by financial crisis. It increased the imported price of PV modules (Miller and Hope 2000). It demotivated private sellers to involve in the business, which in 2000 only a few dealers were selling SHS units on a cash basis (2000: 97).

2. Cinta Mekar Microhydro Power Plant Project

Cinta Mekar Microhydro Power Plant Project (MHPP) operates in the Cinta Mekar village in Subang Regency, West Java Province. It was commenced in 2003. In this village, there were 640 households with total inhabitants of 2050 people and most of the villagers (90%) are working as a rice farmer with land holding less than 0.1 ha or as a landless farmers who works for land-owners' farm (Sovacool 2013: 186). Therefore, the agricultural activity in the village is small-scale and does not involve sophisticated technology. The village is selected because of the availability of river across the village (*Ciasem River*). Moreover, it was also due to the fact that 122 of 640 households did not have access to electricity and relied on kerosene for lightening since they were unable to pay for both instalment cost and monthly payments of electricity from PLN grid (2013: 186).

The project was initiated by a Jakarta-based NGO, *Yayasan IBEKA* (IBEKA). IBEKA started the project by conducting consultation with the villagers about their energy needs and also identifying the stakeholders (Sovacool 2013: 186). The NGO deals with the economics and energy issues in rural areas. Its main activities include building infrastructure in villages, conducting research on renewable energy, training on small hydro activity, and encouraging economic activity in rural areas[40].

For the project, IBEKA cooperates with several other actors, such as private sector, the Central Government and community, with financing support from international donors. In this project, the Central Government is represented by DGE and PLN. DGE provided policy support and guidance. PLN, as regulated, would purchase all excess power produced by the plant. The private sector involved in the project is HIBS, a local company based in West Java. HIBS, at the early phase, provided one-third of the capital expense of the project and once the project started, bear the operational cost. HIBS also provides technical assistance and build infrastructure of the project. HIBS receives 50% of shared revenues. Community involves in the project through Mekar Sari Cooperatives (*Koperasi Mekar Sari*) which provided community assets to cover the equity of their loan to UNESCAP. 50% of revenues is given to the community after the project started. *Koperasi Mekar Sari* has also responsibility to provide labour in construction process and to conduct maintenance activity once the plant operated. *Koperasi Mekar Sari* and HIBS collaboration is based on a contractual joint venture with each party hold 50% of ownership (Sovacool 2013: 187).

Financing of the project is covered by three actors, IBEKA, UNESCAP and HIBS. The total costs are US$225,000. HIBS and UNESCAP covered the investment costs with each parties contributed US$75,000. UNESCAP funds came from the Government of Netherlands (Loh 2010: 25). IBEKA covered a same amount of cost which is used for social assessment and preparation, microhydro dissemination, capacity building and training facilities (Tumiwa et al. 2009: 4). The electricity produced is sold with a tariff of Rp 432 (US$0.045)/kWh to PLN under Power Purchase Agreement for low and medium voltage grid. The monthly sales revenue is approximately Rp 25 Million (US$2600). The net monthly profit is approximately Rp 10 Million (US$950). The monthly profit is then shared equally to HIBS and *Koperasi Mekar Sari* (2009: 4).

This profit is used by the community for several social and economic activities. *Koperasi Mekar Sari* distributes the profit to the villagers by providing electricity connection to 122 households, paying school fees for 156 students from the poorest households, building a health clinic, providing a microcredit loans for the villagers' production activities and enhancing infrastructure such as roads, building and telecommunication (2009: 6). The profit utilisation is arranged based on the prioritisation that decided through survey and voting process with the inhabitants (Sovacool 2013: 187).

Capacity building activities for the villagers is conducted by IBEKA (Loh 2010: 25). Monitoring activities, as a self-management project, is held by community itself. It is coordinated by *Koperasi Mekar Sari* (Sayuti 2012: 78). The activities, for

[40] IBEKA (2011) 'About Us'. Available online at http://ibeka.netsains.net/about-us/. Accessed in 20/10/2015

instance, is to monitor the plant reliability by checking the environment condition along the river because if there is any problem there, it can influence the water flow's rate that then affects power plant performance and also electricity supply production (Sovacool 2013: 187). To resolve conflict and communicate problem, the community uses the mechanism of *Koperasi Mekar Sari*'s Meeting (*Rapat Anggota*) (Sayuti 2012: 80). Supervision to the Cooperatives' management is conducted by the Supervisory Body which consist of community representatives through auditing and performance assessment once in three months[41].

In terms of electrification, the project has successfully electrified all households in the village in affordable price. For those who do not have ability to pay for the installation cost, they can get the electricity installation for free and for the rest there are a discount rate, up to 75%, depending on the financial capacity categorisation that are decide by the community forum[42]. Another side benefit is in its environmental impact, in that the electrification is neither gives interference of water required for irrigation nor pollution to the river (2013: 187).

The main factors that determine this project successful are institutional and financing arrangement. In terms of institutions, the setting which gives ownership status to community has motivated the villagers to operate and maintain the infrastructure and surrounding environment (Sovacool 2013: 187, Tumiwa and Rambitan 2010: 15). Moreover, capacity building activities and participative decision making process has maintained local community participation (Loh 2010: 25, Sovacool 2013: 187). The regulation and policy support that obligated PLN to buy the product in reasonable price has also contributed to the sustainability of the project (Tumiwa and Rambitan 2010: 15). In terms of financing, the big fund required is covered by multi stakeholders. Establishment of financing scheme that attracts private sector capital on the one hand and gives profit to the local community on the other hand has maintained sustainability of the fund. In other words, institutional arrangement in Cinta Mekar MHPP Project successfully created incentives for these two actors, so they are eager to maintain the sustainability of the project.

3. Case 3: "Sumba Iconic Islands" Initiative

The "Sumba Iconic Islands" Initiative is located in Sumba islands, an islands in the East Nusa Tenggara Province in the Eastern Indonesia. It has initiated by an international NGO, Hivos, in 2009. The initiative is planned to be implemented in 3 years (2012-2015). The long term goals of the program is to electrify the island with 100% of renewable energy supply in 2020 (Hivos a 2015: 3). Instead of specifically choosing one particular energy resources to produce electricity,

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[41] Institute of Essential Service Reform (2010). *Kemiskinan Energi: Fakta dan Solusi* (Energy Poverty: Fact and Solution), an online booklet, available at <http://www.iesr.or.id/wp-content/uploads/BookletIND250111.pdf> Accessed in 8/11/2015

[42] WWF Indonesia (2009). Cinta Mekar Adopts Community-Based Microhydro Power Plant Management System. Availabale at <http://www.wwf.or.id/en/about_wwf/whatwedo/climate/resouces/?9160/Cinta-Mekar-Adopts-Community-Based-Microhydro-Power-Plant-Management-System> Accessed in 19/10/2015

the initiative attempts to utilise all options available on the island. The renewable energy alternatives are solar, micro hydro, wind and biomass (Lambooy and Foort 2013: 20-25, van der Veen 2011: 18).

Sumba was selected as the Initiative's location because of its inhabitants have low access to energy (24.5% of electrification rate in 2010), high dependency on diesel generator, high transportation costs of oil fuel that has to be taken from other islands, availability of various renewable energy potential and poverty problem (Lambooy and Foort 2013: 14). When the initiative began, there were two main grid systems in Sumba[43] while around 85% of the electricity is generated with diesel plant (van der Veen 2011: 8). Since the PLN conventional grid could not meet the demand, several rental diesel units has existed to maintain electricity supply.

The land condition of Sumba islands is dry compared to most other parts of the country. Despite of its limited potential for agricultural activities, the communities mostly work on agriculture sector, by farming food crops such as rice and cassava, and commercial plant such as coffee and coconut (Hivos b 2012: 13). In one Hivos publication, the rural electrification program has encouraged more productive farming activities in rural areas (Hivos a 2015: 5-6).

Stakeholders participated in the Initiative are Hivos, other NGOs, private sectors, Central Government, donors, and Local Government (Provincial and Regency). The stakeholders are classified into two groups based on its responsibility: Steering Committee and Working Group. The Steering Committee consists of all those stakeholders. The Working Group's member are MEMR and Hivos. It has the responsibility on policies, implementation and communication (Lambooy and Foort 2013: 17). Hivos roles, as a working group, are identifying local partner that can deliver and implement the projects, maintaining coordination and organising the communication with other stakeholders (2013: 17). The local partner selected, for example, is one woman working for local civil society organisation[44]. Local partner's main task is to translate the project goals into a system that addresses the real needs of the poor people on Sumba such as secure food production and better education. For example, communicating with farmers to build common understanding of the project potential in supporting farming daily activities (HIVOS a 2015: 4).

Central Government are represented by MEMR through the Directorate General of New, Renewable Energy and Energy Conservation (DGNREEC) and PLN. MEMR gives regulatory framework and supporting policy. MEMR also took ownership of the project (Lambooy and Foort 2013: 15). PLN role is providing the power plant/generator. According to Hivos publication in its official website[45], PLN has installed 30,000 solar panels in the island during the implementation. Local Government is represented by the Energy and Mineral Resources Office (*Dinas ESDM*) in both provincial and regency level. Local Government has express support, formally, by signing Memorandum of Under-

[43] Waingapu and Waikabubak

[44] One of the local partner is Sulis Setiawati. She is selected to be local partner when the local organisation she worked for became a partner in the program.

[45] Hivos Worldwide (2015) "Climate and Energy Campaign 2012-2015: Iconic Island Project Sumba".
<https://hivos.org/activity/climate-and-energy-campaign-2012-2015-iconic-island-project-sumba> Accessed in 22/10/2015

standing (MoU) with Hivos, MEMR and PLN about their commitment to contribute to the Initiative. However, the MoU content seems to be very general without any further detail, tangible tasks and more importantly, no legal consequences (2013: 17).

Other stakeholders' presence depends on the energy sources. For micro hydro power plant, Hivos collaborates with IBEKA, a Java-based NGO with a reputation of successfully executes the project of Cinta Mekar MHPP. IBEKA funds one pilot project in Kamanggih Village with the community through Kamanggih Cooperative hold the ownership of the project (2013: 24). For wind turbine power project, PT Sumberdaya Sewatama (Sewatama) will own and operate the wind turbine. Sewatama is an Indonesian IPP. Sewatama and Hivos has signed MoU which arrange Hivos support to the wind power project (Hirsch et al. 2015: 31). Sewatama set the target of electricity sales price of Rp 2,750 (US$ 0.20)/kWh. Currently, Sewatama is still negotiating the purchase price with PLN and expect for a special PPA mechanism to get appropriate price, and when in case it fails to reach the agreement, the price gap will be filled with DANIDA financial support (2015: 31). DANIDA is the Danish donor agency.

DANIDA is not the only international donors involve in the initiative. There are also other donors' appearance, especially in financing. Indeed, the project is funded by multi-donors, mostly from the Asian Development Bank (ADB) with US$ 1 million[46] and the Norwegian government with approximately US$ 2 million[47]. Hivos expense in this initiative are supported by the Ministry of Foreign Affairs of the Netherlands with 416,039 Euro (approximately US$ 450,000)[48].

Relations between Hivos as a coordinator with other stakeholders will be a key factor whether the initiative can be continued or not. At the beginning, Hivos did not even start with a full plan of the program. Instead, it was started with just the Initiative's objective in order to let the program grows with the input from all the stakeholders (Lambooy and Foort 2013: 30). Relations between Hivos and the Government, both Central and Local, nowadays seems collaborative. It can be seen from agreement signed between Hivos and MEMR, PLN, and four Regency Government, to show every parties commitment (2013: 30). However, to see if this formal agreement really works, it takes more time. One possible indicator is willingness of the Government through PLN to purchase generated electricity in appropriate price, as shown in Cinta Mekar MHPP case.

Furthermore, the stakeholders' relations with the local community is crucial. There was an indication at the beginning of implementation that 'bottom-up' support is lacking in Sumba. Social structure does matters in this occasion. There are division between the member of community who own land and animals and

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[46] Publication on the ADB Official Website (21 May 2013). "ADB to Support Sumba's Transformation into 100% Renewable Energy Island". Available online at http://www.adb.org/th/node/150944

[47] Publication on the Norway Embassy Jakarta Official Website (31 October 2013). "Norwegian Embassy to support Hivos and ADB in Realising 100% Renewable Eenergy on Sumba". Available online at http://www.norway.or.id/Norway_in_Indonesia/development/Indonesia/Norwegian-Embassy-to-support-Hivos-in-realising-100-renewable-energy-on-Sumba/#.VcN2Cfmqqko

[48] Hivos Worldwide (2015) "Climate and Energy Campaign 2012-2015: Iconic Island Project Sumba".
<https://hivos.org/activity/climate-and-energy-campaign-2012-2015-iconic-island-project-sumba> Accessed in 22/10/2015

the other members who work for those owners of land and animals. It reflected in decision-making process, in which those who are not land owners does not effectively participate (2013: 30). The class relations that appeared during the program can be an obstacle, especially when information is monopolised. Therefore, the institution has to minimise the potential of elite capture, a situation where the benefit of the program is caught by the local elites.

Nonetheless, from Hivos report, so far the benefit is caught by farmers, women and children. The farmers can farm during the dry season because of the solar irrigation project. Before the initiative started, farmers unable to farm during 8 months of dry season. The women are able to grab additional income by creating handicrafts after sunset and the children enable to study in the evening. These activities was difficult to do before the electricity is connected to their house (Hivos a 2015: 5-6). These positive result is indeed a glimpse of hope in the future. However, the financial sustainability for this Initiative is questionable. It is because the Initiative uses mostly grant from Donors. For the future, it needs to create an institutional arrangement that can ensure the financial sustainability and keep the capital flows inside the community.

Chapter 5
Institutional Capacity Assessment on Rural Electrification Projects

From the three case studies narratives, the initial conclusion can be drawn is that there is certain institutional settings that effectively support the rural electrification program, while another institutional arrangement failed to make the program achieve its objective. To see which capacity of the successful institutional settings is replicable to other projects in the future, and which capacity of the failed institutional arrangement is lacking in the stopped project, it is important to assess the elements of institutional capacity. It is analysed by using capacity variables as mentioned by Blomquist and Ostrom (1999), which are information, communication, cost-sharing arrangement, enforcement and monitoring.

A. Capacity Assessment

1. Information

Information rules affects the amount and type of information available to the participants in an action arena (Polski and Ostrom 1999: 17). From the findings, it is known that in Cinta Mekar MHPP project, villagers had received information about the project since the preparation phase of the project. The information sharing was held by IBEKA through public gatherings, where also used to identify villagers' energy needs through consultation. Information about energy needs are crucial at the beginning because it can be an effective basis that would make the objective of the project more relevant to the principal needs. The capacity to make the villagers well-informed about the objective of the project, the benefit they could obtain, the responsibility they have to take, is sufficient for this project. However, the mechanism that can make information effectively accessible can be different in other villages. So, to develop this capacity, it needs to look at specific village context.

In the SHS project, the information sharing mechanism was very different. The project initiated by the World Bank officer without any information given to the rural people as a target at the formulation process. In turn, it was also lack of information about the villagers' energy needs. Instead, it was only based on the market experience of solar PV selling by one private dealer in one particular area. In the implementation, there was no adequate information about the products' performance, quality, cost and benefit to the consumer. In this case, incomplete information has been the weakness of the institution.

In the Sumba Iconic Island Initiative case, the arrangement sets the local partner selected by the coordinator to be an agent to provide information to the villagers. It can be a strategic move, assuming that the local partner understand the local context, including an effective information provision in the villages.

2. Communication

There are two dimensions of communication, according to Blomqvist and Ostrom (1999), which are dissemination of information-gathering process and discourse among users about their common problem (1999: 66). In Cinta Mekar case, there are a forum to discuss prioritisation of utilisation of the profit of selling electricity to PLN grid. With this forum, dissemination process has a platform that is claimed as democratic and inclusive (Sovacool 2013: 187). The villagers also assembles regularly to attend training activities regarding certain issues related with the power plant conducted by IBEKA. Moreover, to resolve conflict, there is *Koperasi Mekar Sari*'s member meeting as a mechanism. It can be said that Cinta Mekar project has much capacity to maintain a communication framework.

The SHS Project does not seem have such a framework. The capacity building activities, where usually become a platform for problem sharing, was not conducted for the community. Instead, it was only for private dealers. So, it can be drawn that in SHS project, there was lack of inclusive communication framework in the institution. For Sumba case, Hivos, as initiator and executor, uses local partner to disseminate the importance of the initiative and sharing daily issue. So far, it has not created a problem. However, in the long run, it relies on local partner capacity, including their ability to maintain communication with the villagers and respond to the change that may happen.

The next question for Cinta Mekar is whether the forum is sufficiently accommodative. Many decision making forums in Indonesian villages are dominated by the village elites (Bebbington 2006: 1961). In this kind of situation, the forum is not going to be a meaningful participation platform for those who come from the lower class, or the powerless. The situation has happened in the early phase of Sumba case where the landless villagers does not have same opportunity with the land owners in the forum.

However, according to Blomqvist and Ostrom (1990: 66), imperfect forum, where the forum only be used for information sharing and participants interaction, implies a prospect for participation improvement in the future. Indeed, the asymmetrical position in the communication forum has to be concerned due to the uncertainty of village elite behaviour. When the elite is benevolent, the problem is barely exist, but when it is not, elite capture problem may emerge so then the objective of providing electricity for all might not be reached.

3. Cost-sharing Arrangement

Although all the projects uses Donors fund to start, the cost-sharing arrangement in Cinta Mekar much has more potential to make the electricity supply more sustainable rather than the SHS project. According to Blomqvist and Ostrom (1999: 67), agreement on cost-sharing is influenced by the symmetry of interests in relation with the product. From the findings, cost-sharing arrangement in Cinta Mekar seems to be successful to allocate the costs among stakeholders. Distribution of interests matters to allocation of costs (1999: 66-67). Private sector (HIBS) interests in making profit is accommodated with the profit they can obtain from electricity selling, in exchange with the ownership of the

plant with the community. Communities' interests in receiving consistent electricity supply is accommodated with installation and maintenance of the power plant by themselves with support from IBEKA's training activities. NGO (IBEKA) interests in empowering community through rural electrification project as its organisation mission is accommodated as it is implied in the active participation of the community. The Government interests in increasing electrification rate is also accommodated. According to literature, the shared understanding on what benefit can be achieved when all actors cooperate makes an agreement on costs-sharing arrangement 'a trivial matters' (1990: 66). The private firm and the NGO, supported by donors, expend finance as a start-up capital, while the community provides the labour force and maintenance, and the Government buy the products. In other words, Cinta Mekar has adequate capacity to create a system of incentive that motivate the actors to cooperate and agreed on cost-sharing arrangement.

The SHS project has different story. It implied interests of private sector, state, and donors to expand the SHS market rather than the rural community's. So, it is understandable that the community was not motivated to spend extra cost to buy the products because they probably did not see their interests of receiving reliable electricity supply with less cost compare to the conventional one was accommodated by the project. Moreover, since the project did not offer feasible potential revenue, the private sector did not have strong intention to join the project. In this case, the capacity to create a system of incentive is missing, or limited.

For Sumba case, it is still difficult to evaluate the cost-sharing arrangement because either the project is still in embryonic stage or the stakeholders is still in negotiation process. Another reason is because it involves many actors in many different smaller project. These actors indeed have their own interests. For the future, it is worth to build an institutional settings that is able to catch the actors' interests and create the system of incentives based on it.

4. Enforcement

The enforcement rules here is related with the capacity for the making and enforcing the contracts (Blomquist and Ostrom 1990: 67-68). The institutional capacity in Cinta Mekar is enough to make the relevant stakeholders make the contract. The presence of contingent contract to reach common agreement can be explicitly seen in this case. The ownership and revenue division is arranged by the joint-venture contract between community and local private sector. Price of the sold product is agreed through the Power Purchase Agreement between PLN, as state representatives, and community and private. The accepted cost-sharing is reached through an agreement among NGO, donors and the private company. For enforcing process, it can be seen from the findings that since the contracts signed, there have not been an irrespective action to the contract shown from any actors. In other words, the capacity to enforcing the agreement is adequate. However, looking at the failure of several Cooperatives from the

past to commit to the contract[49] when the demand became higher and business area became wider, there is a need to anticipate similar issue in the future.

The SHS project also seems do not have an enforcement issues. Since the beginning, there was no violation reported. However, in implementation level, it failed to encourage the banks to make a contract with the dealers that then created a problem in the supply side. The Sumba Iconic Island Initiative case does not show any action against the agreement. It is because the contract signed is recently a document of intention rather than an agreement with serious legal consequences.

5. Monitoring

The monitoring condition relates with the capacity of the institution to provide adequate monitoring to deter participants from defecting and to gives sanction as a consequence (Blomqvist and Ostrom 1990: 69). Given that the monitoring activity in Cinta Mekar is conducted by the community, it can be more effective with an assumption that the people as a local inhabitants knowing more about actual situation in a day-to-day basis. It can be done more often too because those who conduct the activity stay in the village, compare to the monitoring activity by actor from outside the village that would only be done occasionally as scheduled in the contract.

In SHS Project, the monitoring activities was only to ensure the standard of product quality through regular technical assistance, conducted by the World Bank. What is missing in this case is that it ignored the monitoring activities in the consumer sides. Rather, it was stuck in pre-selling technical standards monitoring. The institutional capacity was only able to monitor the supply side but lost to monitor what is actually happened in the important part of the project, the users in rural areas.

For the case of Sumba, the interesting piece is that it uses local partner to monitor the project. It can be an effective monitoring activities assuming that the local partner has adequate understanding on the local problem and future issues may arise referred to local dynamics.

B. Capacity Comparison

To compare, particular criteria is needed to judge whether certain capacity variable is sufficient or not to make the project successful. Information rules is appropriate when there are settings that can aid information to participants (Blomquist and Ostrom 1999). The adequate communication capacity can be seen from the availability of forums to communicate about information and its implications (Blomquist 2010: 631). The sufficient capacity of cost-sharing arrangement means that the cost-sharing formula is accepted by most participants as being equitable (Blomquist and Ostrom 1999: 69). The adequate capacity of enforcement rules can be seen through availability of enforceable and contingent

[49] See Chapter 3.3

contract (Blomquist et al. 2010: 632). In terms of monitoring, the institutional capacity is enough when the institutionalised means to conduct the monitoring activities is trusted by the actors (2010: 632). The table below sums the elements' assessment based on the criteria.

Table 5: Comparison of Case Studies' Institutional Capacity Elements

Criteria	Case 1	Case 2	Case 3
Information to participants	Not available	Available	Available
Forum to discuss information and implication	Not available	Available	Available
Cost-sharing formula accepted by participants as being equitable	Not available	Available	Not available
Enforceable contingent contracts	Partially available	Available	Partially Available
Means to conduct the monitoring activities trusted by the actors	Not available	Available	Available

Availability of required information for the stakeholders, both in the beginning of and during the process, shows the sufficient information rules in the second and third case. In opposites, lack of information about the programme to the community in the first case reveals that the information rules capacity is not adequate to encourage the programme to be successfully implemented. In the similar vein, the communication element that is represented by the existence of regular forum to communicate problems, information and training, implies the sufficient capacity in the second and third cases. In the first case, the institution did not provide such a two way communication event.

In terms of enforcement, the rules are applied in second cases, and partially exist in the first and third case. It is partial in the first case because the capacity to create a contract between village financial provider with the community and dealers was missing. For the third case, it is indeed there is an agreement between the NGO and multilevel of Government, however, the contingent contract between those actors with the community does not take place yet. Moreover, the agreement signed is still in expressing intention and commitment without further legal consequence.

For monitoring rules, the activities conducted by the community in second case and the selected local partner in the third case seems to be effective to ensure the programme well-implemented until recently. It was different in the first case where there is no rules to ensure that monitoring activities would be conducted in every level of programmes. Furthermore, the comparison also reveals that the element available in the second case and did not exist in the first case and yet to appear in the third case is the cost-sharing formula agreed by all the actors.

From the comparison, it can be drawn that the first case was lack of institutional capacity. The assessment on five elements has shown the project failed to set up

an institution that can arrange information provision, forum for communication, agreed cost-sharing arrangement, maintained contingent contract and effective trusted monitoring activities. While the third case has a lot of potential, because the institution has capacity to provide required information, effective communication method, and initial contingent contract, as well as regular monitoring activities. However, the third case still does not have an appropriate cost-sharing arrangement for the future. In other words, to make the rural electricity service sustainable, the arrangement that can create and maintain a cost-sharing formula agreed by all stakeholders is required, as shown in the success story of second case and lesson learnt of the first case.

Chapter 6
Conclusion

What type of institutional capacity can be developed to improve villages' electrification rate in Eastern Indonesia? This research paper central recommendation is the cost-sharing arrangement. The result demonstrates that, the cost-sharing formulas which are accepted by stakeholders is the key successful factor of the second case study, and one aspect that the first case missing, as well as the model that the third case is still looking for.

It can be done by creating a system of incentive that accommodate the interests of stakeholders, especially rural community who is often left aside from the project, and local private sector that is usually reluctant to bring financial capital to rural areas. The result reveals that the settings which divided the selling revenue and ownership for 'fifty-fifty' between local private company and community under the community's ownership to the power plant has given appropriate margin to the private and sustainable electricity supply to the community. It is indeed similar with the Public-Private Partnership (PPP) arrangement. However, it emphasizes more on community roles, participation and benefit.

How about other four capacity variables? Other variables are also important. At least until recently, institutional capacity in the second case can provide sufficient information, regular mechanisms for communication, effective enforcement and local-based regular monitoring. It can be seen from availability of information for participants, existence of forum to discuss information and implication, presence of cost-sharing formula agreed by actors as being equitable, as well as established enforceable contingent contracts and means to conduct the monitoring activities trusted by actors. All the factors has made the project sustainable. The third case has shown prospective capacity in those elements. However, the cost-sharing arrangement that is accepted by all actors is still missing in the third case.

Nonetheless, there are several things to notice regarding the cost-sharing arrangement. First, the project has to be based on principal needs. The villagers must become a priority of the project. The result shows that a rural electrification project that is lack of information and communication rules to the village inhabitants was finally failed to achieve its objective. To catch the villagers' energy needs, a regular communication activities, such as a forum or a local meeting, has to be started since the preparation stage. Second, the Government's support is required. The findings show that the power purchasing agreement with PLN is crucial since the agreed price would determine the revenue of electricity sales. The incentive system will not be exist without the certainty of benefit. Third, from three case studies, all uses donors' fund. The level is indeed different. In the first case, the donors covered all of the financing. In the second case, it is only one-third of the total fund covered to start the project. In the third case, most of the funds are provided by the donors, from the early phase of the Initiative. To reduce this dependency to the donors' fund, the Government has actually a lot of potential to cover the finance. So, the Government capacity has to be improved, especially in regard with budgeting priority, and research and development program to enhance the technology.

Finally, the rural electrification program with alternative technology is a kind of program that requires a lot of funds, much high technologies and economically less profitable with many stakeholders can involve. Therefore, the institution has to have adequate capacity to create the system of incentives that become a bridge between those hardships and stakeholders' interests. This paper believe that it can be built from the proper cost-sharing arrangement. It is indeed not a solution for all the rural electrification problem, but an improvement in institutional capacity will makes the policy perform better.

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