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국제학석사학위논문

A Comparative Study on Official Development Assistance Policy for Dissemination of Renewable Energy:

Capacity Development in Recipient Countries

재생에너지 공급을 위한 공적개발원조 정책 비교 연구:

수원국의 역량 개발을 중심으로

2014년 2월

서울대학교 국제대학원

국제학과 국제협력전공

최 나 은

A Comparative Study on Official Development Assistance Policy for Dissemination of Renewable Energy:

Capacity Development in Recipient Countries

A thesis presented by

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Graduate Program in International Cooperation

for the degree of Masters of International Studies

Graduate School of International Studies

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February 2014

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The Graduate School of International Studies
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A Comparative Study on
Official Development Assistance Policy
for Dissemination of Renewable Energy:
Capacity Development in Recipient Countries

Presented by **Naeun Choi,**
Candidate for the degree of Master of International Studies,
and hereby certify that the examined thesis is worthy of acceptance:

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Date: February 2014

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논문제목 : A Comparative Study on Official Development Assistance Policy for Dissemination of Renewable Energy: Capacity Development in Recipient Countries

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Abstract

A Comparative Study on Official Development Assistance Policy for Dissemination of Renewable Energy:
Capacity Development in Recipient Countries

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Dissemination of renewable energy with adaptable technology has received much attention from donor countries under the slogan of 'Universal Access to Energy' in the last recent years. However, despite past failures in deploying the renewables to Least Developed Countries (LDCs) and developing countries, previous studies are unable to find the reasons of failures and possible improvements. They only described higher failure rates of institutional development component in developing renewable energy and its respective constituents.

In order to find the reasons of frequent failures and analyze the institutional development component for deployment of renewable energy in recipient countries, this thesis applied capacity development strategies and capacity assessment framework developed by United Nations Development Programme (UNDP) which are widely used in the field of development. This analytical framework was examined by comparative case studies of Burkina Faso and the Philippines to find out how capacity development of individuals and entities that constitute institutions affects the successful deployment renewable energy and secures its sustainability through Official Development Assistance (ODA) policies.

By delineating the process of capacity development in recipient countries for securing renewable energy, this thesis confirmed rationale of dissemination of renewable energy with adaptable technology in LDCs and developing countries. Also, by examining real application cases of capacity development, this thesis offers analysis on ODA policies for dissemination of renewable energy as a stepping stone for further development of recipient countries.

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Keywords: Official Development Assistance (ODA), Renewable energy, Adaptable technology, Universal Access to Energy, Institutions, Capacity development, Sustainability

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List of Acronyms and Abbreviations

AfDB	African Development Bank
BAPA	Barangay Power Association
BEP	the Barangay Electrification Program
BMZ	German Ministry of International Cooperation
CIDA	Canadian International Development Agency
DAC	Development Assistance Committee
DGIS	Dutch Foreign Ministry
DOE	the Department of Energy
GDP	Gross Domestic Production
GOP	the Government of the Philippines
GIZ-EnDeV	Dutch-German Energy Partnership Energizing Development
FAFASO	Foyers Améliorés au Faso
FDI	Foreign Direct Investment
ICS	Improved Cooking Stoves
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
IRAST	Institute of Research in Applied Sciences and Technologies
JICA	Japan International Cooperation Agency
LDCs	Least Developing Countries

MDGs	Millennium Development Goals
NEA	the National Electrification Administration
NGOs	Non-Governmental Organizations
NPC	National Power Corporation
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PRSP	Poverty Reduction Strategy Paper
PV	Photovoltaic
REMD	Renewable Energy Management Division
UN	United Nations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WB	World Bank

I. Introduction

1. ODA and Renewable Energy

Every year, billions of dollars flow from governments of developed countries to governments in developing countries for the various purposes. However, over the past few decades, the number of people impoverished by a lack of modern energy access has remained unchanged. Energy is arguably one of the major challenges the world faces today, particularly for the most vulnerable people in the world. The availability of energy service, in other words, electrification, has a distinct impact on them in terms of health, limited opportunities for economic development, and widening the gap between the haves and have-nots. Also, though energy is not included in Millennium Development Goals (MDGs), it is estimated that the goals will not be achievable without massive increase in the quality and quantity of energy services.[1] In this regard, many international organizations and think tanks

[1] UNDP, *The Energy Access Situation in Developing Countries: A Review Focusing on the Least Developed Countries and Sub-Saharan Africa,* (2009), Retrieved from

such as United Nations Development Programme (UNDP), World Bank (WB), or The Sustainable Energy for All initiative recently have invested their resources to ameliorate current situation and increase awareness about the issues.

1.1. Effects of Universal Access to Energy for Development

Effectiveness of electrification is well-known, and there already exists numerous researches emphasizing its effects for development. Electrification means connecting of houses, towns or areas with a supply of electricity. Among others, rural electrification has been one of the most critical issues in the world for the last century such as the New Deal's Rural Electrification Administration of the United States under the slogan of "Electricity for all." The Roosevelt Administration believed that providing electricity for poor farmers in rural area is the government's obligation to promote economic development across the country evenly.[2] Since few areas in Least Developing Countries (LDCs) and developing countries are urbanized yet, researches

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http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Sustainable%20Energy/energy-access-situation-in-developing-countries.pdf (accessed October 12, 2013): 1-4

[2] Theodore Saloutos, *The American Farmer and the New Deal*, (Ames: Iowa State University Press, 1982), 22-25.

about rural electrification have many implications for future development of energy in developing countries. According to International Energy Agency (IEA) report, 1.5 billion people, which is 18% of the world's population, do not have access to electricity, of which 85% live in rural areas.[3]

According to UNDP reports, universal access to energy is expected to contribute to achieve MDGs 1 to 7.[4] In impoverished and underdeveloped areas, only small amount of electricity can change many aspects of a society. First of all, certainly there are social benefits through lightning, TV and radio and cell phones. Lights in the evening increase time available for education and work, remote education is provided through TV and radio, and receiving remittance is possible with cell phones charged with electricity.[5] Moreover, health benefits such as indoor cleaner air, preventing many water-borne diseases with electric-powered wells, better nutrition from improved storage capabilities from refrigeration largely contributes to increase general level of

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[3] International Energy Agency, *World Energy Outlook: Executive Summary*, (2009), Retrieved from https://www.iea.org/textbase/npsum/weo2009sum.pdf. (accessed July 27, 2013): 7.

[4]UNDP explains that the effects of electrification are directly related to achieving MDGs by reducing poverty and creating jobs by making possible income-generating and entrepreneurial opportunities (MDG 1); empowering women by liberating women and girls from time-consuming tasks, such as collecting fuel, pounding grain and hauling water, freeing time for education and economic activity (MDGs 2 and 3); Improving health conditions by decreasing women and children's drudgery, and eliminating 'kitchen smoke' that kills 2 million people – mtly women and children – every year (MDGs 4, 5 and 6); Promoting clean energy solutions that contribute to low-carbon development (MDG 7). For more, see UNDP, *Fast Facts: Universal Energy Access*. (2011), Retrieved from http://www.undp.org/content/dam/undp/library/corporate/fast-facts/english/FF-Universal-Energy-Access.pdf (accessed August 10, 2013)

[5] Eric Martinot, Akanksha Chaurey, Debra Lew, Jose Moreira, and Njeri Wamukonya, "Renewable Energy Markets in Developing Countries," *Annual Revies of Energy and the Environment*, 27 (2002): 326-28.

people's social welfare in the recipient countries.[6]

Rural electrification was also expected to have great potential to raise incomes through economic development, but is turned out that productive economic development follows only when other supporting economic infrastructure and skills are available.[7] Electrification has great potential for increasing productivity at reduced cost because labor can free from necessary daily chores such as carrying water and collecting fuel. It also allows mechanization of many farming operations, such as threshing, milking, and hoisting grain for storage. However, so far most electrification projects have been focused on providing energy for residential purposes, and thus support for economic development was limited.[8]

1.2. Renewable Energy for Universal Energy Access

Energy demands from people in poor areas of LDCs and developing countries

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[6] World Bank Independent Evaluation Group, *The Welfare Impact of Rural Electrification: A reassessment of the Costs and Benefits*, (Washington: World Bank, 2008): 39-50

[7] Eric Martinot, Akanksha Chaurey, Debra Lew, Jose Moreira, and Njeri Wamukonya, "Renewable Energy Markets in Developing Countries," *Annual Revies of Energy and the Environment*, 27 (2002): 326-28.

[8] World Bank Independent Evaluation Group, *The Welfare Impact of Rural Electrification: A reassessment of the Costs and Benefits*, (Washington: World Bank, 2008): 33-35

leapt in recent decades. This made their governments to provide subsidies to meet the needs of electricity via traditional sources of energy, fossil fuels, with the extension of electricity grid.[9] Despite governments support, however, these conventional sources of energy still cannot overcome some difficulties. First of all, as discussed, these energy systems are unsustainable without continuous governments' subsidies.[10] Considered that most LDCs and developing countries have fragile tax system, it is hardly expected that governments can maintain that system without external support. Second, the gird system is rarely reachable to the poorest people, most of whom lives in remote rural areas or even in urban slums.[11] Also, the cost of conventional energy is often too expensive because most of fuel and technologies required to use the energy are imported. Many developing countries are reluctant to relying primarily on imported energy because of volatile price in the last few decades, which will lead their national economy to be exposed to risks unexpected.[12]

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[9] Christopher Flavin and Molly Hull Aeck, *Energy For Development: The Potential Role of Renewable Energy in Meeting the Millennium Development Goals*, Worldwatch Institute, (2009): 6-7, Retrieved from http://www.worldwatch.org/system/files/ren21-1.pdf. (accessed November 20, 2013)

[10] Ibid., Institute for Energy Research, *Developing Countries Subsidize Fossil Fuels, Artificially Lowering Prices,* (2013). Retrieved from http://www.instituteforenergyresearch.org/2013/01/03/developing-countries-subsidize-fossil-fuel-consumption-creating-artificially-lower-prices/ (accessed November 20, 2013)

[11] Christopher Flavin and Molly Hull Aeck, *Energy For Development: The Potential Role of Renewable Energy in Meeting the Millennium Development Goals*, Worldwatch Institute, (2009): 6-7, Retrieved from http://www.worldwatch.org/system/files/ren21-1.pdf. (accessed November 20, 2013)

[12] Ibid., UNEP, *Green Economy: Why a Green Economy Matter for the Least Developed Countries*, (2011): 3-4, Retrieved from

Rather, renewable energy could be better source of energy to meet the current demands of developing countries and MDGs. Benefits of adopting renewable energy in LDCs and developing countries will be discussed in details in the following chapters, but in brief, renewable energy sources with adaptable technology satisfy their demands not only in economic terms but also social and environmental conditions. For developing countries like the Philippines or Indonesia, which is discussed later in case studies, reducing dependence on imported fuels and ensuring stable sources of energy are one of the critical reasons of adopting renewable energy.[13] In addition, since renewable energy with adaptable technology is locally produced and consumed, it does not require large centralized grid system but mini- or off-gird that requires less cost and lower level of technology. [14] It also creates economic opportunities for the poorest people in the course of its local development, which is in accordance with the goals of inclusive development and MDGs.[15] Environmental consideration is, of course, well-known benefits of utilizing renewable energy. Hence refocusing policies and making investments for renewable energy sectors are better strategies for the energy sector in LDCs and rural electrification in developing countries.

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http://www.unep.org/greeneconomy/Portals/88/documents/research_products/Why%20a%20GE%20Matters%20for%20LDCs-final.pdf (accessed November 20, 2013)

[13] Philippine Department of Energy, *Empowering the Nation through Renewable Energy*, (2013), Retrieved from http://www.doe.gov.ph/renewable-energy-res. (accessed October 27, 2013)

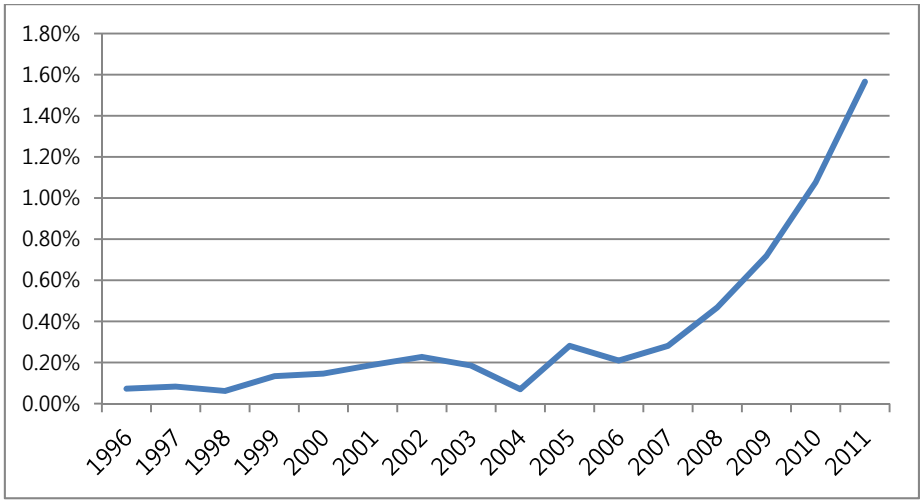
[14] OECD/IEA, *World Energy Outlook: Energy For All – Financing Access For The Poor*, (Paris: International Energy Agency, 2011):31

[15] UNEP, *Green Economy: Why a Green Economy Matter for the Least Developed Countries*, (2011): 3-4, Retrieved from http://www.unep.org/greeneconomy/Portals/88/documents/research_products/Why%20a%20GE%20Matters%20for%20LDCs-final.pdf (accessed November 20, 2013)

1.3. ODA and Renewable Energy

Due to the advantages of utilizing renewable energy for the purpose of universal energy access for all in the context of MDGs and human development, donors started to give positive thoughts on it since mid-2000s. The percentage of ODA for renewable energy out of total has increased. (See figure 1.) Then, what are the benefits of dissemination of renewable energy by ODA? Why donor countries have to pay more attention to renewable energy sectors than other actors?

Figure 1. Recent Increase in RE ODA as percentage of Total ODA



Source: OECD Statistics

Not only the positive effects of universal access to renewable energy that is discussed in previous chapters, but also ODA contributes to overcome barriers to greater reliance on renewable energy. The most critical barrier is

expensive cost for initial development.[16] Renewable energy usually requires larger cost for installation compared to fossil fuel power sources.[17] The cost of renewables' total lifetime is represented by the initial cost.[18] It is a serious weakness to renewables, even though its operational costs on a lifecycles basis are cheaper than those of fossil fuels. If all else is equal, governments of developing countries and LDCs have shown tendency of choosing fossil fuels over renewables, and private sectors also prefers fossil fuels in order to minimize up-front investment costs.[19] Thus, donor countries are practically the only actors who can take initiative to prove effectiveness of renewable energy and to meet MDGs. ODA also tends to trigger leverage effects for further Foreign Direct Investment (FDI) by private sectors.[20]

Also, when donors are member countries of Organisation for Economic Cooperation and Development (OECD,) the partnerships and the results of many projects for renewable energy were concluded as successful

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[16] Beck, Fredric, and Eric Martinot. "Renewable Energy Policies and Barriers." in *Encyclopedia of Energy*. Vol. 5. (2004): 365-383

[17] Ibid., Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for Renewable energy.* (Washington DC: World Resources Institution. 1994): 6

[18] John Armstrong, and Jan Hamrin, "Renewable Energy Overview," in *The Renewable Energy Policy Manual*, United States Export Council for Renewable Energy, 2000, Retrieved from http://www.oas.org/dsd/publications/Unit/oea79e/ch05.htm (accessed December 1, 2013)

[19] Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for Renewable energy.* (Washington DC: World Resources Institution. 1994): 6

[20] UNEP, *Green Economy: Why a Green Economy Matter for the Least Developed Countries*, (2011): 10, Retrieved from http://www.unep.org/greeneconomy/Portals/88/documents/research_products/Why%20a%20GE%20Matters%20for%20LDCs-final.pdf (accessed November 20, 2013)

cases.[21] Kacper Szulecki, Philipp Pattberg, and Frank Biermann illustrated in their research that if the donors are limited to the member countries of OECD,[22] most partnerships, six out of seven cases, have yielded visible outputs, and three among them[23] were included in the five most effective partnerships. [24] Therefore, OECD member countries need to take responsibilities to put more efforts for successful renewable energy projects.

So far, the reasons why donors have to contribute to universal access to renewable energy are discussed. Not only normative rationales to achieve human development goals but empirical reasons underpin ODA to deploy renewable energy in recipient countries. In order to do so, lessons must be learnt from past failure experience to overcome current difficulties. Why

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[21] Kacper Szulecki, and Philipp Pattberg, and Frank Biermann. "Partnerships for Sustainable Development in the Energy Sector: Explaining Variation in their Problem-solving Effectiveness." in Philipp Pattberg, Frank Biermann, Sander Chan, and Aysem Mert. (ed.) *Public-Private Partnerships for Sustainable Development*, (Glos, UK: Edward Elgar Publishing Limited, 2012,): 89-95

[22] States are often observed as even less effective leaders than other organizations or private sectors. Although states are very reluctant to give away their leadership to other actors such as private sectors or non-governmental organizations (NGOs,) it turned out that in general having public actors as main partners does not necessarily improve the effectiveness of partnerships and projects. Among 30 partnerships in energy sectors, 16 partnerships are led by states, 8 by intergovernmental organizations, or 6 by UN agencies. However, the result of partnerships led by public sectors was not necessarily effective, compared to the cases not led by them, both of which were about 47 per cent of non-operational rates. However, if the donors are limited to the member countries of OECD, the result becomes different.

[23] Methane to Markets, Renewable Energy and Energy Efficiency partnership and Renewable Energy Policy Network for the 21st Century

[24] Kacper Szulecki, and Philipp Pattberg, and Frank Biermann. "Partnerships for Sustainable Development in the Energy Sector: Explaining Variation in their Problem-solving Effectiveness." in Philipp Pattberg, Frank Biermann, Sander Chan, and Aysem Mert. (ed.) *Public-Private Partnerships for Sustainable Development*, (Glos, UK: Edward Elgar Publishing Limited, 2012,): 89-95

ODA for renewable energy from 1970s to 1990s were turned out futile? Why only few cases were successful even after then? What are the current obstacles to disseminate renewable energy in recipient countries?

2. Previous Studies

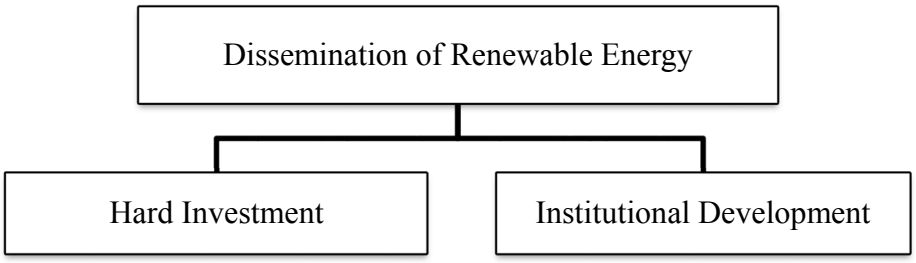
In order to find explanations on why past dissemination of renewable energy by ODA was failed to be stabilized in recipient countries, this research surveyed relevant literatures. By studying previous researches, this study is able to find what are the factors critically related to successful dissemination of renewable energy and in what way improvements are required for each factor.

Most aid projects for renewable energy can be broken down into a 'hard investments' component such as provision of equipment and physical infrastructure and an 'institutional development' component which includes the promotion of planning, accounting, maintenance, staff training, and other forms of technical assistance.[25] According to IEA, the costs to provide

[25] David Fairman and Michael Ross, "Old Fads, New Lessons: Learning from Economic Development Assistance" in Robert Keohane, and Marc Levy, (ed.)

modern energy access, most of which could be subsidized by ODA, are composed of four factors; 1) The capital investment provides the costs of household access to electricity from the first connection and the cost to maintaining an increasing supply over time; 2) the cost of facilities to use the energy for people currently lack of them; 3) the cost for broader technical assistance such as advices for institutional and policy development; 4) the cost for developing infrastructure.[26]

Figure 2. Policy Components for Dissemination of Renewable Energy



Most ODA so far has been focused on the factor two, four, and partly one, which belong to hard investment components, so that the results of electrification were limited to the short-term effects.[27] However, for the factor

Institutions for Environmental Aid, (Cambridge, MA: MIT Press, 1996): 41

[26] OECD/IEA, *World Energy Outlook: Energy For All – Financing Access For The Poor*, (Paris: International Energy Agency, 2011): 14

[27] Douglas Barnes and Willem Floor, "Rural Energy in Developing Countries: A Challenge for Economic Development," *Annual Review of Energy and the Environment*, Vol. 21 (1996): 497-530,; ETSU, *Final Report to the Overseas Development Administration: Critical Success Factors for Renewable Energy*, 1995, Retrieved from r4d.dfid.gov.uk/PDF/Outputs/Energy/R6143.pdf (accessed October 19,

three and the latter part of factor one, both of which belong to institutional development components, the process of capacity development is necessarily required in order to extend the effects for the longer term.

2.1. ODA and the Initial Failure of Renewable Energy

The initial development for renewable energy has started in developing countries since 1970s. Many small-scale renewable energy technologies like biogas, wind turbines, and solar heaters were promoted by many bilateral and multilateral development assistance agencies. From 1980 to 2008, ODA for renewable energy totaled about $1 billion, most of which went for geothermal, wind, and hydro technologies that require higher level of technology.[28] For the last few decades, however, most ODA for renewable energy flowed into capital asset. Much smaller amounts were spent for maintenance, and even less than 10 percent were for educating technical and managerial skills and building national capacity. It resulted in a variety of technical problems of maintenance that had been tackled by local people if

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2012),; Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for Renewable energy.* (Washington DC: World Resources Institution. 1994)

[28] OECD. *Measuring Aid for Energy*. 2010. Retrieved from http://www.oecd.org/investment/aidstatistics/45066235.pdf (accessed July 10, 2013)

they would have been trained.[29] In other words, ODA for renewable energy mostly focused on projects for technical demonstrations that were scarcely self-sustaining but not able to be replicated, and were carried out without prior consultation and partnership building. As a result, development projects for renewable energy were considered failures due to poor technical performance, and weak suitability to user needs and unfavorable local conditions stemming from lack of involvement of relevant stakeholders.

One of the reasons why electrification by renewable energy was unsustainable in the developing recipients was the level of technology that was adopted for renewable energy. According to IEA, renewable energy means energy derived from natural processes that are replenished at a faster rate than they are consumed. Solar, wind, geothermal, hydro, and some forms of biomass are common sources of renewable energy.[30] So far, developed countries like Germany or the United States which have higher levels of technical skills and financial power have invested in renewable energy for its development and commercialization, and they have been acknowledged as the market leaders.[31]

Recently, not only developed countries but some developing countries like China competitively have entered renewable energy industries to be a

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[29] Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for Renewable energy.* (Washington DC: World Resources Institution. 1994):11

[30] IEA. *What is renewable energy?*. 2013. retrieved from http://www.iea.org/aboutus/faqs/renewableenergy (Accessed July 1, 2013)

[31] Daniel Yergin, "Rebirth of Renewables," The Quest, (New York: Penguin Press, 2011.:523-613,; Victor, David, and Kassia Yanosek. "The Crisis in Clean Energy: Stark Realities of the Renewable Craze." *Foreign Affairs*. July/August (2011)

future market leader. Since renewable energy technology is not mature enough to generate electricity for industries, it has comparatively lower entry barrier for them compared to other energy sources like nuclear energy. Moreover, most renewable energy such as geothermal or wind power are affected by geographical locations, developing countries often have more potential to develop renewable energy which is suitable for local condition. Renewable energy that developed and developing countries are interested in is as following.[32] (See table 1.)

Table 1. Renewable Resources for Electricity Generation

Hydropower

Micro- (<100 KW), mini- (up to 5 MW), and small hydro (about 5-30 MW) turbines are among the most mature renewable technologies and have been used for many years to power rural areas. Only about 10 percent of the developing world's potential small hydro capacity has been exploited. Unused capacity is greatest in China and Latin America.

Biomass

Direct combustion of agricultural and forestry residues for combustion in turbines is growing rapidly. The processing of sugarcane, rice, coconut, and other tropical foods creates organic waste that can be burned directly or

[32] Ibid.

gasified. Bagasse, the residue from sugarcane processing, can be burned in cogeneration facilities whose surplus electric power output can be sold to the grid. While such resources are available throughout Asia, Latin America, and Africa where agricultural and forest products are processed, growing crops for energy production would greatly expand potential capacity. Aero-derivative turbines, when coupled with gasifiers, are expected to make biomass generation more efficient.

Wind

Wind has long been used for pumping water and other mechanical uses. Now wind turbines are springing up in many countries to generate either grid-connected or independent power. Wind resources (though generally stronger in temperate regions) are sufficient to produce thousands of megawatts of power in Asia and Latin America, and are especially strong along coasts, western China, parts of India, northeast and south Brazil, the Andes, and North Africa. India alone is estimated to have 20,000 MW of potential wind capacity.

Geothermal

Untapped geothermal resources can be found on both sides of the Pacific Rim (especially Bolivia, Chile, Costa Rica, Guatemala, and Thailand) and in the East-African Rift Valley. Installed geothermal capacity in developing countries is projected to grow from about 2,000 MW in 1993 to about 5,000

MW in 2000. Because of their large scale and baseload operation, the output of geothermal plants resembles that of conventional generating technologies.

Photovoltaic

Photovoltaic (PV) installations already serve tens of thousands of household and other uses in rural Asia, Latin America, and Africa. At present costs, PV installations are used primarily to supply individual users far from electricity grids, although interest is growing in using central PV power stations for remote villages. The strength of sunlight in most developing countries is sufficient for PVs to operate economically.

Solar Thermal

Solar thermal technologies generate electricity by concentrating sunlight onto a line or point where heat is transferred to a fluid that drives a turbine. This technology is little used outside the United States, where a 360 MW hybrid solar parabolic trough/natural gas system is operating in California. (Among developing countries, only Mexico and India are currently considering such projects.) Other types of solar thermal technologies (parabolic dish, central receiver) have some advantages, but solar trough/gas hybrid technology is the most commercially mature. Much of the developing world has strong enough direct radiation to eventually make low concentrator trough technologies competitive with conventional power sources.

Sources: IPCC, Kozloff K. and Shobowale O, Danier Yergin : 523-613

2.2. Renewable Energy with Adaptable Technology

Unfortunately, the technological skills of most LDCs are still even below that level of such developing countries. There have been so much examples of failure in LDCs due to having adopted infrastructure for renewable energy with too high level of technology and without the process of capacity building. However, renewable energy is composed of a heterogeneous class of technologies. Some renewable technologies can be deployed at the point of use in rural and urban environments, while others are primarily deployed within large centralized energy networks. Also, though an increasing number of renewable energy technologies are technically mature and are being deployed at significant scale, others are in an earlier phase of technical maturity and cannot be used without grid.[33]

For environmental ODA program or projects for LDCs, however, it is crucial to utilize proven or reliable technologies and designs that are proper to local conditions.[34] Receiving ODA is often a critical opportunity for LDCs and developing countries to kick their economic development off. In this circumstance, if developed countries urge LDCs to initiate renewable energy industry with immature technologies, they would hardly accept the suggestion.

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[33] Intergovernmental Panel on Climate Change (IPCC), "Summary for Policymakers." in *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. 2012. Retrieved from https://www.ipcc.ch/pdf/special-reports/srex/SREX_FD_SPM_final.pdf (accessed September 15, 2013)

[34] ETSU. *Final Report to the Overseas Development Administration: Critical Success Factors for Renewable Energy*, (1995):27, Retrieved from r4d.dfid.gov.uk/PDF/Outputs/Energy/R6143.pdf (accessed October 19, 2012).

Even if they do so, it will certainly end up as a failure like other past experiences because people in LDCs often do not have capabilities mature enough to sustain the facilities. What they need is not only the renewable energy infrastructure but also the capacity to maintain the equipment. Therefore, donors should consider providing the equipment that fits into local condition and is created with technology in accordance with the technical level of local people.

Renewable energy with adaptable technology got hints from usual renewable energy. Compared to the aims of usual renewable energy, which is to generate electricity for industry, renewable energy with adaptable technology is generated and consumed in a more primitive fashion and generates small amount of electricity for daily use.[35] The direct use of heat from solar energy for cooking or battery charger is an example.[36] The types of adaptable-tech renewable energy that is commonly installed in LDCs and developing countries are as following. (See table 2.) Though renewable energy with adaptable technology seems to use low level of technology in the eyes of scholars and policy makers in developed world, for the purpose of universal access to energy, basic electrification for lightening and charging batteries definitely improves qualities of daily life of people and creates chances for further development.

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[35] Kris Decker, *The Bright Future of Solar Powered Factories in Sharing Sustainable Solution*, 2012, Retrieved from http://sharingsustainablesolutions.org/?p=2169 (accessed July 1, 2013)

[36] Ibid.

Table 2. Renewable Energy with Adaptable Technology

Micro-hydro power

Micro-hydro power is the small-scale harnessing of energy from falling water, such as steep mountain rivers. "Run of the river" systems do not require a dam or storage facility to be constructed. Instead they divert water from the stream or river, channel it in to a valley and drop it in to a turbine via a pipeline called a penstock with low-cost. They also avoid the damaging environmental and social effects that larger hydroelectric schemes cause, including a risk of flooding. The micro-hydro station provides poor communities in rural areas with an affordable, easy to maintain and long-term solution to their energy needs.

Small-scale wind power

People living in rural areas who do not have access to the national grid may have to travel long distances and wait long times for their batteries to be recharged at commercial centers. However small-scale wind power help people to reduce such difficulties. LDCs take advantage of wind power on a small scale, both for irrigation such as wind pumps and for generation of electricity through wind generators. Small wind turbine systems, with a capacity ranging from 50 W to 10 kW and rotor diameter ranging from about 0.5 m to 7 m, are primarily used in battery charging. Wind energy systems can also operate in parallel with diesel sets or solar PV systems.

Improved cooking stoves

A shortage of fuel for cooking is one of the many problems faced by people in LDCs. In certain areas where local sources of firewood are completely depleted, gathering fuel is generally women's work but is fraught with dangers such as rape or life threatening attacks. However improved cooking stoves tackle this issue through the use of more fuel-efficient stoves which are both affordable and easy to use. Biomass, which is the main source of energy in communities where people lack any access to grid electricity, is generally used as fuel for this stove, and its improved structure makes burn smaller amounts of fuel and less smoke that will engulf their homes and lungs.

Solar power

Since many LDCs are located near the equator, the most powerful natural energy resource is the sun. Solar technology is used in various ways such as providing heat energy for cooking or generating electricity to operate simple technologies. Sun lights are connected to solar panels which then sit on an open and un-shaded spot such as a roof. These panels then convert sunlight to energy which charges the battery built into the equipment.

Sources: Practical Action, S. Karekezi and W. Kithyoma

2.3. Higher Failure Rates in Institutional Development Components

Changes in the level of technologies adaptable to the recipients have ameliorated a lot of difficulties in hard investment components. It is concluded that in terms of technical barriers, the hard investment component, universal access to modern energy is achievable thanks to proven and innovative solutions we possess so far.[37] However, many development projects for renewable energy have been still broken down once donors left.

Dissemination of renewable energy to be a genuine part of national industries of a recipient country demands persistent efforts from both donors and recipients. According to WB and other bilateral development agencies, the probability of failures in programs' institutional development components are reported about twice as often as the hard investment components and that the most common obstacles to the successful implementation of projects are managerial or institutional problems.[38] As U.S. Agency for International Development (USAID) and Canadian International Development Agency (CIDA) reviewed, about half to two-thirds of the partner governments they had funded were unprepared for institutional development by the end of

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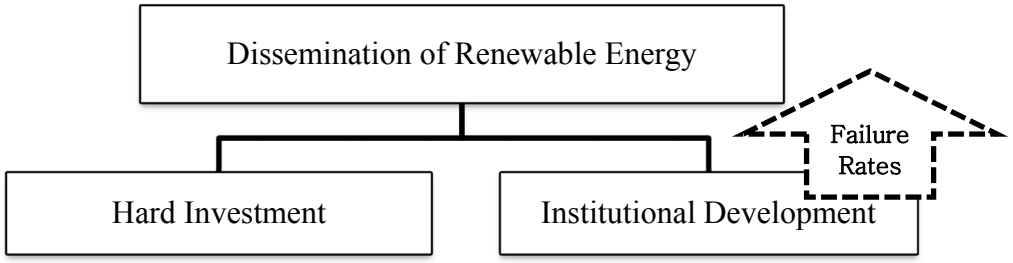
[37] UNDP, *Fast Facts: Universal Energy Access*. (2011), Retrieved from http://www.undp.org/content/dam/undp/library/corporate/fast-facts/english/FF-Universal-Energy-Access.pdf (accessed August 10, 2013)

[38] David Fairman and Michael Ross, "Old Fads, New Lessons: Learning from Economic Development Assistance" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996) :42

projects.[39] These reviews describe that without institutional arrangements that arise from increased capacity of local people, such as the creation of government institutions or markets, supply of renewable energy through ODA is nothing but 'embedded' industry. When donors cease to provide ODA, electrification with renewable energy has slight potentials to sustain the system.

Figure 3. Higher Failure Rates in Institutional Development Component



For the long-term viability of renewable energy, thus, institutional development component must be addressed.[40] The constituents of the

[39] Robert Hicks, Bradley Parks, J. Timmons Roberts, and Michael Tierney, *Greening Aid?*, (New York: Oxford University Press, 2008): 12-14

[40] Eric Martinot, Akanksha Chaurey, Debra Lew, Jose Moreira, and Njeri Wamukonya, "Renewable Energy Markets in Developing Countries," *Annual Revies of Energy and the Environment*, 27 (2002): 326-28; Gary Jones and Griffin Thompson, "Renewable Energy for African Development," in *Solar Energy,* Vol. 58, (1995): 103-109; Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for Renewable energy,* (Washington DC: World Resources Institution. 1994); International Renewable Energy Agency, *Capacity Building Strategic Framework for*

component vary according to each scholar or institution. They include planning, accounting, manufacturing, engineering, equipment maintenance, staff training, technical assistance, sustainable sources of credit and expertise, administrative capabilities, incentive structures for sustained operating performance.[41] Those components are believed to be included in three layers of capacity developments in general, and international organizations such as International Renewable Energy Agency (IRENA) and UNDP pursue capacity development framework as a key strategy for developing renewable energy.[42]

IRENA, 2012, Retrieved from https://www.irena.org/DocumentDownloads/Publications/Capacity_Building_Strategy.pdf (accessed December 12, 2013)

[41] David Fairman and Michael Ross, "Old Fads, New Lessons: Learning from Economic Development Assistance" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996) :41; Eric Martinot, Akanksha Chaurey, Debra Lew, Jose Moreira, and Njeri Wamukonya, "Renewable Energy Markets in Developing Countries," *Annual Revies of Energy and the Environment*, 27 (2002): 326-28; Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for Renewable energy,* (Washington DC: World Resources Institution. 1994):9; UNDP, *Fast Facts: Capacity Development,* 2011, Retrieved from http://www.undp.org/content/dam/undp/library/corporate/fast-facts/english/FF-Capacity-Development.pdf (accessed December 2, 2013)

[42] Elisabeth Clemens, Kamal Rijal, and Minoru Takada, *Capacity Development for Scaling Up Decentralized Energy Access Programmes: Lessons from Nepal on its role, costs, and financing*, (Warwickshire: Practical Action Publishing, 2010); International Renewable Energy Agency, *Capacity Building Strategic Framework for IRENA,* 2012, Retrieved from https://www.irena.org/DocumentDownloads/Publications/Capacity_Building_Strategy.pdf (accessed December 12, 2013); UNDP, *Capacity Assessment and Development: In a Systems and Strategic Management Context,* 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013)

2.4. Capacity Development with Ownership

Before analyzing three layers of capacity developments in the following chapter, the conceptual development of it from capacity building needs to be discussed as backgrounds. For recent decades, capacity has been one of the hottest terms in the field of development in that nothing is as popular to promote and as difficult to accomplish as it. The term has been widely used by various international organizations such as World Bank or the United Nations, but the definition of it is still in controversy. For World Bank, capacity for development means "the availability of resources and the efficiency and effectiveness with which societies deploy those resources to identify and pursue their development goals on a sustainable basis."[43] However, since the definition is too much focused on resource that is not a sole source for development, the definitions by UNDP and OECD are generally accepted in the field of development. Capacity herein refers to abilities, skills, and competencies of local people and communities to plan, manage, implement, and account for results of policies and programs. It includes the process of identifying, formulating and analyzing the problems of particular relevance to their societies, and designing effective strategies to solve them. To be effective, such capacity needs to be built up in all sectors

[43] World Bank, The Capacity Development Results Framework: A Strategic and Results-oriented Approach to Learning for Capacity Development, 2009, Retrieved from http://siteresources.worldbank.org/EXTCDRC/Resources/CDRF_Paper.pdf?resourceurlname=CDRF_Paper.pdf. (accessed October 10, 2013)

and levels of society.[44]

Due to its importance recognized, donors have put efforts to foster and promote capacity building under the rubrics from technical education to institution building and public sector management, but it was not successful. For example, calls for capacity building are sprinkled throughout Agenda 21, the plan for sustainable development produced by the 1992 UN Conference on Environment and Development.[45] UNDP has embarked on a major support to promote environmental capacity building, called Capacity 21.[46] OECD's Development Assistance Committee (DAC) countries also agreed that building capacity is one of the main factors that will reduce poverty and accelerate achievement of the MDGs through the Paris Declaration on Aid Effectiveness and the Accra Agenda for Action.[47] However, the great majority of what has been written on is normative and concerned with

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[44] OECD, *The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action*, 2008, Retrieved from www.oecd.org/dataoecd/11/41/34428351.pdf. (accessed October 10, 2013); UNDP. *Capacity 21 Global Evaluation Report 1993-2001*. 2002. Retrieved from http://www.undp.org/content/dam/aplaws/publication/en/publications/capacity-development/cap21_global_evaluation_1993-2002/Capacity%2021%20Global%20Evaluation%20Report%201993-2001.pdf. (accessed October 30, 2013)

[45] United Nations, *Agenda 21*. 1992. Retrieved from sustainabledevelopment.un.org/content/documents/Agenda21.pdf. (accessed October 30, 2013)

[46] UNDP, *Capacity 21 Global Evaluation Report 1993-2001*, 2002, Retrieved from http://www.undp.org/content/dam/aplaws/publication/en/publications/capacity-development/cap21_global_evaluation_1993-2002/Capacity%2021%20Global%20Evaluation%20Report%201993-2001.pdf. (accessed October 30, 2013)

[47] OECD, *The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action*, 2008, Retrieved from www.oecd.org/dataoecd/11/41/34428351.pdf. (accessed October 10, 2013)

practical management questions, which reflects donors' perverse focus on certain parts of capacity building such as technological demonstration.

In this vein, the concept of capacity development emerged as a new paradigm. Though there still exist controversies over the definition among different international organizations, ownership of the recipient countries is the keyword of the new definition. WB defines capacity development as "a locally driven process of learning by leaders, coalitions and other agents of change that brings about changes in sociopolitical, policy-related, and organizational factors to enhance local ownership for and the effectiveness and efficiency of efforts to achieve a development goal."[48] OECD's approach to capacity development has stronger emphasis on local ownership. Capacity development is "the responsibility of partner countries with donors playing a support role. It needs not only to be based on sound technical analysis, but also to be responsive to the broader social, political and economic environment, including the need to strengthen human resources."[49]

The definition by UNDP much clearly indicates how donor-driven capacity building has been developed into owner-driven capacity development. Capacity building is "used to express the process of institution building or training at individual, institutional and systemic levels." The issue remaining, after all conventional interventions in developing countries and countries in

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[48] World Bank, *Capacity Development*, 2011, Retrieved from http://go.worldbank.org/U7WIN8DE00 (accessed October 10, 2013)

[49] OECD, *The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action*, 2008, Retrieved from www.oecd.org/dataoecd/11/41/34428351.pdf. (accessed October 10, 2013)

transition, is the sustainability of the intervention results. On the other hand, capacity development is therefore "the process of creating, mobilizing, utilizing, enhancing or upgrading, and converting skills and expertise, institutions and contexts. It can be short-term, to address an immediate problem, or long-term, to create an environment."[50] All in all, knowledge and technologies could be learnt through training, but should be internalized in the recipient countries in order to build right capacities and make good policies for solving their problems.

Table 3. Comparison of Donor-driven Capacity Building and Owner-driven Capacity Development

	Capacity building	**Capacity development**
Nature of development	Improvements in economic and social conditions	Societal transformation, including building of "right capacities"
Conditions for effective development cooperation	Good policies that can be externally prescribed	Good policies that have to be home-grown

[50] UNDP, *Capacity 21 Global Evaluation Report 1993-2001*, 2002, Retrieved from http://www.undp.org/content/dam/aplaws/publication/en/publications/capacity-development/cap21_global_evaluation_1993-2002/Capacity%2021%20Global%20Evaluation%20Report%201993-2001.pdf. (accessed October 30, 2013)

The asymmetric donor-recipient relationship	Should be countered generally through a spirit of partnership and mutual respect	Should be specifically addressed as a problem by taking countervailing measures
Capacity development	Human resource development, combined with stronger institutions	Three cross-linked layers of capacity: individual, institutional and societal
Acquisition of knowledge	Knowledge can be transferred	Knowledge has to be acquired
Most important forms of knowledge	Knowledge developed in the North for export to the South	Local knowledge combined with knowledge acquired from other countries including both the South and North

Source: Sakiko Fukuda-Parr, Carlos Lopes, and Khalid Malik, "Institutional innovations for Capacity Development," in Sakiko Fukuda-Parr, Carlos Lopes, and Khalid Malik, (ed.) Capacity for Development: New Solutions to Old Problems, (London: Earthscan Publications Ltd, 2002): 20

3. Research Question and Purpose of Research

There have been several muddling issues about dissemination of renewable energy. The first one is why many donors still provide ODA for renewable energy which even shows tendency of increasing amount for the last decade. Taking into account of frequent failures of projects until early 2000s, it is questionable why donors still fund ODA for renewable energy sectors. The other question is under the current circumstances of increasing demands and supplys for renewable energy in LDCs and developing countries, what policies and actions should be taken in order not to make those efforts futile anymore.

The first question is addressed in previous studies. It is true that most projects having invested large amount of resources for renewable energy proved slight chances of viability until early 2000s. However, technological development to the level of practical viability and newly emerged agendas like MDGs made scholars and policy makers give second thoughts on it. Under the new slogans such as 'Sustainable energy for all' or 'Universal energy access for all,' renewable energy is in limelight again as an alternative source of energy that is suitable for local context.

Then, a missing puzzle is obviously how to make resurgent ODA funds for dissemination of renewable energy viable and effective. While hard investment components has been improved to the level that can achieve the

goal of universal access for modern energy, factors for institutional development still requires further research. Against this backdrop, this research finds the essential factors of ODA policies with the aims of successful dissemination of renewable energy in recipient countries in forthcoming chapters. Under the premise of using adaptable technology that is appropriate for the local level of technologies of the recipient countries, potentials of institutional development through capacity development is analyzed in order to find why they are critical variables and how to secure viability and, further, sustainability.

II. Analytical Framework

1. Three Layers of Capacity Development

Though many international organizations or scholars have studied capacity development strategies for deployment of renewable energy, UNDP is the only organization that developed the capacity assessment framework. The indicators in the framework are adopted in this research as well in order to decide success or failure of capacity development. Capacity assessment approaches in three dimensions: point of entry, core issues, and functional and technical capacities.[51] While core issues tackle key barriers of capacity development, and functional and technical capacities are closely linked to project development cycles, point of entry targets actors in the process of capacity development and most widely accepted in the field of development.[52]

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[51] Elisabeth Clemens, Kamal Rijal, and Minoru Takada, *Capacity Development for Scaling Up Decentralized Energy Access Programmes: Lessons from Nepal on its role, costs, and financing*, (Warwickshire: Practical Action Publishing, 2010)

[52] Ibid.; International Renewable Energy Agency, *Capacity Building Strategic Framework for IRENA,* 2012, Retrieved from https://www.irena.org/DocumentDownloads/Publications/Capacity_Building_Strategy.pdf (accessed December 12, 2013); UNDP, *Capacity Assessment and Development:*

Since this research analyzes ODA policies for initial deployment of renewable energy, the focus is brought to actors, particularly to government institutions that create policies.

The point of entry dimension is composed of three layers: the individual, the entity/institutional, and the systemic/societal level.[53] Though each level is basic units of analysis, as figure shows, capacity development needs to be understood as interdependent and interconnected system. All components operate together toward a common purpose, dissemination of renewable energy in a recipient country.

Capacity development at the individual level specifically means the process of changing individuals' attitude and behavior through knowledge, skills exchange and training.[54] This is the major dimension because institutions and societies need skills and knowledge of individuals. Effective function of individuals takes place through learning-by-doing, participation and the exercise of ownership, on-the-job training, mentoring, and other learning processes empowering the local people.[55] Also, the individual level of capacity development distinguishes itself from traditional technical

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In a Systems and Strategic Management Context, 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013)

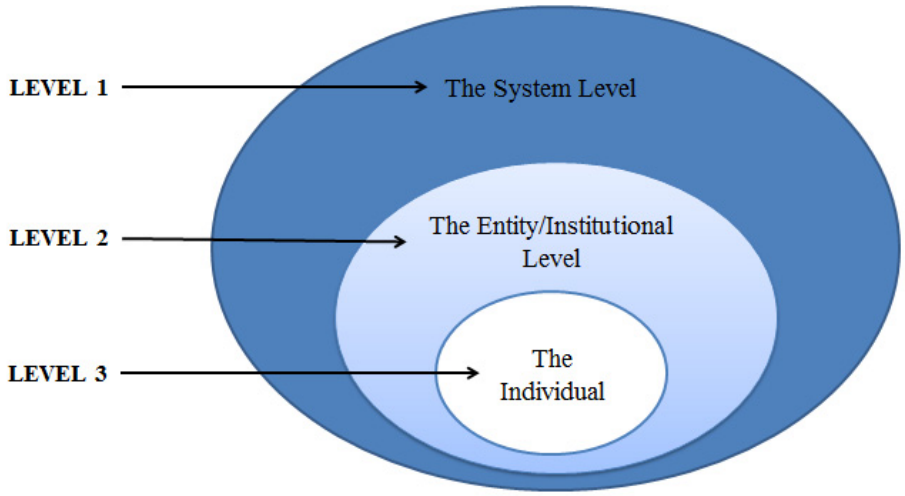
[53] International Renewable Energy Agency, *Capacity Building Strategic Framework for IRENA,* 2012, Retrieved from https://www.irena.org/DocumentDownloads/Publications/Capacity_Building_Strategy.pdf (accessed December 12, 2013):12-14; UNDP, *Capacity Assessment and Development: In a Systems and Strategic Management Context,* 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013):5-13

[54] Ibid.

[55] Ibid.

assistance in that demand-driven training based on ownership is important.

Figure 4. Three Layers of Capacity Development



Source: UNDP, *Capacity Assessment and Development: In a Systems and Strategic Management Context,* 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013):7

The entity level of capacity development includes strengthening performance and function of formal or informal entities, and institutions are also included in this level. Unlike traditional capacity building approach, here more emphasis is placed on entities' interaction with other stakeholders by developing mandates, tools, guidelines, standards with organizational values and management systems for information resources that facilitate and catalyze

institutional arrangements.[56] This is most typical entry point for analysis of capacity development because most ODA policies targets government agencies for projects.[57] For example, donor agencies target a Ministry of Finance for the reformation, and then zoom-out to system level or zoom-in to individual level for the program expansion.[58]

The system level is so-called enabling environment. It is the highest level that involves policy, economic, regulatory and accountability frameworks where formal and informal organizations and individuals operate.[59] Thus, this level is concerned with the broad issues such as nation-wide governance or poverty alleviation, and involves various components such as legal and regulatory or policy system.[60]

However, the system level is not included in the analysis of this research for the reasons following. First, this research analyzes ODA policies for initial deployment of renewable energy, thereby the focus is brought to entity level which is typical entry point for most ODA policies.[61] Second, in

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[56] Ibid.

[57] ; UNDP, *Capacity Assessment and Development: In a Systems and Strategic Management Context,* 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013):11

[58] Ibid.

[59] International Renewable Energy Agency, *Capacity Building Strategic Framework for IRENA,* 2012, Retrieved from https://www.irena.org/DocumentDownloads/Publications/Capacity_Building_Strategy.pdf (accessed December 12, 2013):12-14; UNDP, *Capacity Assessment and Development: In a Systems and Strategic Management Context,* 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013):5-13

[60] Ibid.

[61] Keith Kozloff and Olatokumbo Shobowale, *Rethinking Development Assistance for*

order to discuss dissemination of renewable energy at system level, all relevant areas of a recipient country from market mechanism to legal bodies need to be covered, but this is too broad and far from the goal of this research.[62]

2. Capacity Development at Individual Level: Innovation

As explained previously, knowledge and technologies for the development cannot be transferred but acquired by local individuals with the sense of ownership. Although typical development processes are regarded as participation, mentoring, workshop, and other learning processes empowering the local people, simple process of learning and using of the technologies cannot internalize them into the recipient countries. The course of learning-by-doing or further innovation is required to secure sustainability. Without this, recipient countries have to rely on external sources for technological improvements to create or maintain infrastructure, and consequently it becomes impossible for them to achieve the goal of development programs in

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Renewable energy, (Washington DC: World Resources Institution. 1994):1-9

[62] Eric Martinot, Akanksha Chaurey, Debra Lew, Jose Moreira, and Njeri Wamukonya, "Renewable Energy Markets in Developing Countries," *Annual Revies of Energy and the Environment*, 27 (2002): 326-28

the end. Thus, innovation necessary for ensuring sustainability of renewable energy in the recipients need to be redefined in the context of developing countries, and the capabilities required for achieving it also have to be analyzed.

When we refer to innovation, it is usually considered as creating a cutting-edge technology in highly developed industries of the developed countries. However, the definition of innovation is very simple, creating a new thing or a new method of doing something. According to Schumpeter, innovation is the critical dimension of economic development. He classified innovation into five types, which are new products, new methods of production, new sources of supply, the exploitation of markets and new ways to organize business. Though most economists are focused on new products and new methods to produce them, the original definition of innovation is in much broader term.[63] In this sense, innovation is able to function as a driving force of the development in developing countries as well.[64]

Innovation in developing countries has a tendency of taking a different path compared to that of developed countries. All innovation naturally involves imitation to a certain extent, but particularly technological development of developing countries has taken the procedure of imitating the innovative outcomes from developed world in the beginning and then

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[63] Joseph Schumpeter, The Theory of Economic Development, (Cambridge: Harvard University Press, 1934): 66

[64] Rita Almeida, and Ana Margarita Fernandes, "Openness and Technological Innovations in Developing Countries: Evidence from Firm-Level Surveys," *Journal of Development Studies*, Vol. 44 No. 5 (2008): 701-727

improving those outcomes in their ways as South Korea and China have done.[65] In the course of modifying and improving the outcomes by other countries in order to fit into local context, developing countries are able to internalize them by combining their local knowledge and the knowledge acquired from other countries, which would work as a driving force for further sustainable development. Scholars call this type of innovation as 'incremental innovation', and its impact is estimated on the overall economy of developing countries is huge.[66]

In sum, capacity development at individual level is arguably one of the central development challenges of the day, as much of the rest of social and economic progress will depend on it. Particularly for the development of renewable energy in the recipient countries, capacity development of individuals is very critical in that past efforts for the capacity building by the donors were turned out futile. Despite huge volume of technical assistance by the donors, the technologies were failed to be internalized by the recipients. The recipient countries used facilities provided until they are broken, but were unable to sustain them. In the end renewable energy infrastructure became nothing but embedded industries. Thus, capacity development with the process of internalizing knowledge and technology, partly given by the donors,

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[65] Nathan Rosenberg, "Factors Affecting the Diffusion of Technology," Explorations in Economic History, Vol. 10 No. 1 (1972): 3-33,; Pierre-Richard Agnor, and Hinh Dinh, "From Imitation to Innovation: Public Policy for Industrial Transformation," in Poverty Reduction and Economic Management Network, World Bank, *Economic Premise*, No. 115 (May 2013)

[66] Bronwyn Hall, "Innovation and Diffusion," In Jan Fagerberg, David Mowerly and Richard Nelson. (ed.) *The Oxford Handbook of Innovation*, (New York: Oxford Univeristy Press, 2005.): 459-484

must be included as a key factor in ODA policies. With the technological knowledge and skills accumulated, the recipient is able to combine them with local knowledge, which makes further innovation fit into local environment. Strong sense of ownership is a driver for the entire process of it for sure.

3. Capacity Development at Entity Level: Institutional Arrangements

Among many formal and informal entities of a recipient country, organized governmental institutions are prior targets for partnerships to maximize policy effects. It is undeniable that ownership of the recipient government is a critical value as individual level for securing sustainability after ODA projects. However, the initiative of donor agencies at early stage is necessary to increase the success rates.[67] Thus donor agencies have to engage in active

[67] Kacper Szulecki, and Philipp Pattberg, and Frank Biermann. "Partnerships for Sustainable Development in the Energy Sector: Explaining Variation in their Problem-solving Effectiveness." in Philipp Pattberg, Frank Biermann, Sander Chan, and Aysem Mert. (ed.) *Public-Private Partnerships for Sustainable Development*, (Glos, UK: Edward Elgar Publishing Limited, 2012,): 89-95,; Robert Keohane, "Analyzing the Effectiveness of International Environmental Institutions" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996.): 8

interactions with those institutions by developing mandates, tools, guidelines, standards with organizational values and management systems for information resources that facilitate and catalyze institutional arrangements.[68] In this vein, policy networks or dialogues created through interactions between donor agencies and recipient governments can develop into new institutions that take full responsibilities of renewable energy. In order to analyze the development of institutions, the mid-range approach is applied.

3.1. Comparative Institutionalism and Mid-range Theory

New institutionalism is a term used with growing frequency in political science. The reason why institutionalism has implications for this research is that institutionalists are able to capture and analyze the relationships between institutions and individual behaviors in broader terms. Though institutions in general indicate organizations and the rules or conventions promulgated by formal organizations, they also can range from informal rules to standards of

[68] International Renewable Energy Agency, *Capacity Building Strategic Framework for IRENA,* 2012, Retrieved from https://www.irena.org/DocumentDownloads/Publications/Capacity_Building_Strategy.pdf (accessed December 12, 2013):12-14; UNDP, *Capacity Assessment and Development: In a Systems and Strategic Management Context,* 1998, Retrieved from http://mirror.undp.org/magnet/cdrb/GENGUID.htm (accessed December 13, 2013):5-13.

behaviors of organizations.[69] They put strong emphasis on the values and norms that actors develop within institutionalized relationships over time. In addition, they emphasize power factor that is inherent in institutions. For institutionalists, actors including states are not neutral, but they prefer some interest to others. Thus they focus on strategic interactions and how institutions change the context for decision making.[70]

With this comparative institutionalism background, mid-range theory attempts to explain outcomes in particular sectors or at initial policy-making stages, rather than system-wide policy outcomes. Approaches such as development of new policy networks and policy communities are examples of mid-range theory. These can be contrasted to intergovernmental or neo-functionalist integration theories that address the super-systemic and systemic levels to provide generalizable predictions. Mid-range theory, instead, has more modest goals and focus on a sub-systemic or meso-level of analysis, so it usually focus on questions of how policy is shaped in early stages.[71] In this regard, it is applicable and proper theoretical tool to analyze ODA policies for dissemination of renewable energy in the recipient countries.

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[69] Peter Hall, and Rosemary Taylor, "Political Science and the Three New Institutionalisms," *Political Studies*, XLIV (1996): 936-957

[70] Ibid. 936-957,; Kathleen Thelen, and Sven Steinmo, "Historical Institutionalism in Comparative Politics," in Sven Steinmo, Kathleen Thelen, and Frank Longstreth, (ed.) *Structuring Politics*, (New York: Cambridge University Press, 1992.) pp.1-32,; Sven Steimo, "What is Historical Institutionalism?." in Donatella Della Porta, and Michael Keating, (ed.) *Approaches in the Social Sciences*, (Cambridge UK: Cambridge University Press, 2008)

[71] Ibid.; Stephen George, and Ian Bache, "Theories of EU Governance," in Stephen George, and Ian Bache, (ed.) *Politics in the European Union*, (New York: Oxford University Press, 2001.) pp. 19-31

A loophole with the application of mid-range theory from comparative institutionalism is that the concept is originated from the study of domestic political systems, structural functionalism and group theory.[72] So there exist possibilities of losing sensitivity to the influence of the external pressures or the wider international system, which is the strength of approaches derived from international relations.[73] However, in the framework for this research, as depicted in figure 5, donor agencies which can be referred to external pressures from international levels are target of micro-level analysis so that the possibilities of ignoring international influence is diminished. At macro-level, domestic political and administrative structures having existed before starting programs with development agencies are target units of analysis. Last but not least, new institutions at meso-level yield policy outcomes which sometimes could be better or worse than before.

3.2. Institutions in Recipient Countries

[72] Sven Steimo, "What is Historical Institutionalism?." in Donatella Della Porta, and Michael Keating, (ed.) *Approaches in the Social Sciences*, (Cambridge UK: Cambridge University Press, 2008)

[73] Stephen George, and Ian Bache, "Theories of EU Governance," in Stephen George, and Ian Bache, (ed.) *Politics in the European Union*, (New York: Oxford University Press, 2001,) p.29,; Sven Steimo, "What is Historical Institutionalism?." in Donatella Della Porta, and Michael Keating, (ed.) *Approaches in the Social Sciences*, (Cambridge UK: Cambridge University Press, 2008)

A sticking point for finding effective institutions between the recipient governments and the donor agencies is sovereignty issues. According to international law, international organizations and bilateral development agencies are not authorized to enforce rules within the jurisdiction of other sovereign states. The only possible option for those organizations is relying on the administrative capabilities of the bureaucracies of recipient governments. Unfortunately many recipient governments in LDCs and developing countries usually do not have enough capability to carry out large scale projects on their own. Moreover, weak institutions and political systems they have often resulted in high vulnerability from external changes.[74]

Some developing countries may have political structures such as energy ministries while most LDCs do not, and many of both lack political clout and administrative capability to create distinct difference.[75] This means that the mere existence of political and administrative structures at macro-level cannot be concluded in better performance of recipient countries. Instead, they need to improve capability for managing good governance and the effectiveness of policy outcomes. Though resources are given through ODA, if recipient government cannot distribute resources properly in an accountable way, political and administrative structures short of capacity would yield nothing but ineffective policies which may fail to lessen the impact of external

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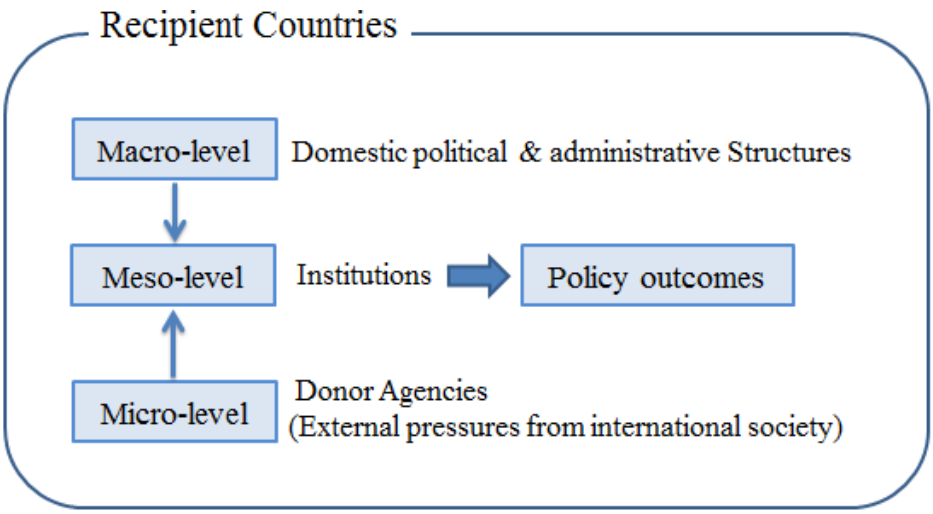
[74] Stephen Kransner, "Transforming International Regimes: What the Third World Wants and Why," *International Studies Quarterly*, 25, no. 1 (1981): 120

[75] Robert Keohane, “Analyzing the Effectiveness of International Environmental Institutions” in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996.) p.13

pressures or tackle domestic counteracting problems.

Figure 5. Institutional Arrangements in Recipient Countries



Therefore, in order to have better and sustainable policy outcomes, existing domestic political and administrative structures of the recipients and donor agencies need to interact with each other, and create new institutions with capabilities. Since institutions are inclined to be resistant to change but dependent on existing path as far as no critical juncture exists, institutions proved with good policy outcomes are likely to follow a path that develops concern, capacity, and favorable environment for successful stabilization of renewable energy in the recipient countries.[76] If the institutions are very successful, they may be developed into political structures someday.

Though new institutions must be established through the interactions

[76] Ibid. p.9

between the recipients' political and administrative structures and donor agencies, in the initial stages, donors should have the leadership due to the imbalance of power inherent in institutions.[77] This has been proved through past experience of financial transfers for renewable energy. Institutions have been less effective unless both their purposes and institutional arrangements are in consistency with the interests of the most powerful actors involved in the issues.[78] This is because political structures, administrative bodies, and government or quasi-government agencies of recipient countries, are void or rarely function properly in developing countries or LDCs.[79]

For donors' leadership, the behavior of bilateral or multilateral donor agencies at micro-level for improving policy outcomes can be divided into two categories. The first one is relational power behavior that accepts existing rules of games, in other words, structures and institutions. Relational power means the ability to change outcomes or influence behavior of others in the course of explicit political decision making processes.[80] On the other hand, meta-power behavior is to alter existing institutions. It is a capacity to newly structure or manipulate institutional arrangements, norms, and values which

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[77] Kacper Szulecki, and Philipp Pattberg, and Frank Biermann. "Partnerships for Sustainable Development in the Energy Sector: Explaining Variation in their Problem-solving Effectiveness." in Philipp Pattberg, Frank Biermann, Sander Chan, and Aysem Mert. (ed.) *Public-Private Partnerships for Sustainable Development*, (Glos, UK: Edward Elgar Publishing Limited, 2012,): 89-95,; Robert Keohane, "Analyzing the Effectiveness of International Environmental Institutions" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996.): 8

[78] Ibid.

[79] Stephen Kransner, "Transforming International Regimes: What the Third World Wants and Why," *International Studies Quarterly*, 25, no. 1 (1981): 120

[80] Ibid.:122

constitute the environment where decisions are made.[81]

With these two types of behavior, donor agencies can ameliorate policy outcomes from institutions. In the case of accepting existing political and administrative structure and institutions, donor agencies with relational power try to improve actors' capacity including both donors and recipients.[82] Though institutional arrangements, norms, and rules may not be altered, better outcomes can be resulted in by improving donors' knowledge about local conditions and environments and recipient countries' governing and administrative capacity to distribute resources.[83] Particularly about donor's capacity, given that arrangements to transfer financial resources in support of renewable energy is relatively new, many potential donors also lack appropriate analytic capability, local knowledge, or long-term ties to recipient counterpart agencies.[84] Meta-power behavior seeks to alter outcomes by adopting strategies to change institutions. Simply, it alters rule of the games, and accordingly, if successfully implemented, relational power is changed as well.[85]

That being said, it does not mean that donors lead the entire procedures of institutional change of recipient countries but only the early

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[81] Ibid.:122

[82] Robert Keohane, "Analyzing the Effectiveness of International Environmental Institutions" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996.): 13

[83] Ibid.

[84] Ibid.

[85] Stephen Kransner, "Transforming International Regimes: What the Third World Wants and Why," *International Studies Quarterly*, 25, no. 1 (1981): 122

stages. Without sufficient agreement between donors and recipients, the institutional change cannot be sustainable, so both actors have to put efforts to find commonalities between the specific purposes and interests each has, which will be further discussed in the following chapter about alignment.[86] Thus, in the course of strategic interactions to reach a balance, sometimes ineffective policy outcomes that are far from original intentions of both actors could be decided. In other words, comparative power and interests each actor holds often decide the direction of policy outcomes from new institutions.

All in all, in this research, mid-range theory is mainly used as an analytical tool to explain changes in outcome and how institutional structures or arrangements in recipient countries influenced on them. At this level, role of donors are comparatively important in that they hold relatively stronger power with capability to control influx of ODA, so that able to lead strategic interaction in the course of decision-making. In order to secure more favorable policy outcomes, donor agencies can seek strategies to enhance capabilities of actors with relational power or to pursue meta-power aimed at changing institutions. However, in order to sustain the effects of improved policy outcomes, agreements between the donor and the recipient countries are necessary, which is called alignment.

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[86] Robert Keohane, "Analyzing the Effectiveness of International Environmental Institutions" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996.): 8

4. Alignment

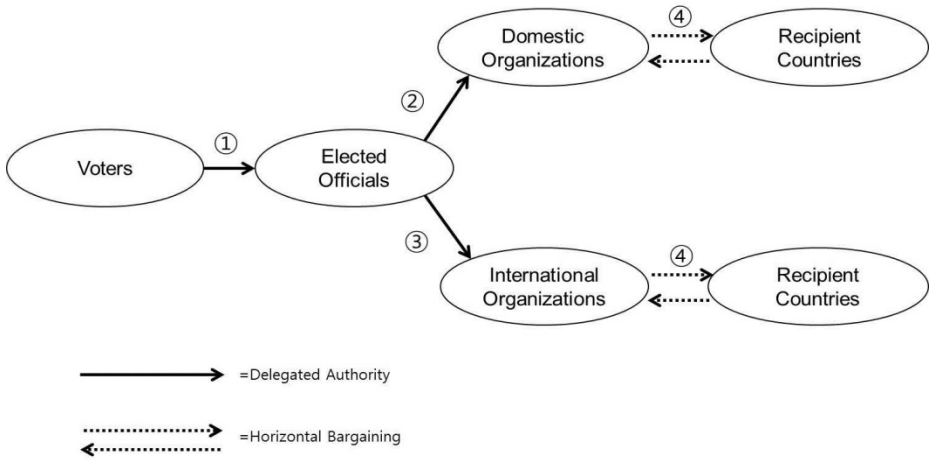
Alignment has been articulated as one of the key issues in the field of development cooperation since Paris Declaration on Aid Effectiveness because donors and recipients had been well aware of the futile costs of aid without it. In many recipient countries, a bunch of bilateral and multilateral donor agencies may be operating at the same time, but most recipient governments have less capability to juggle numerous development programs simultaneously. Some even do not have centralized governmental agencies or mechanism for coordinating those development projects. Then, ODA for renewable energy which is comparatively new type of funds could be a nuisance to those recipient governments.[87]

With regards to sustainability of capacity development and institutional change, a very common but serious problem observed so far is that development programs fall apart once donors left. There are reasons for this. The first reason is lack of harmonization in goals due to a conflict between the short-term interests of donors in efficiently completing hard investments and the long-term goal of fostering institutional development of recipient countries.[88] Donors are usually eager to quickly identify problems of recipient countries and supply technical educations or the organizational

[87] David Fairman and Michael Ross, "Old Fads, New Lessons: Learning from Economic Development Assistance" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996) :41-49

[88] Ibid.

Figure 6. Principal-agent Relationships in Aid Allocation



Source: Robert Hicks, Bradley Parks, J. Timmons Roberts, and Michael Tierney (2010) p.13

skills required to solve them because they, agents at the same time, have obligations to prove their accountability toward their principle, voters or taxpayers, in donor's own country.[89] (See Figure 6.) To some donors, this might be most efficient way to prove their devotion in a given time range. However, the repercussions of a 'discrete' development project are miserable because these donors incline to deprive opportunities of local officials for the training and experience which are capabilities they ultimately need to maintain projects. Thus most recipient countries are neither able to have capacties to independently change institutional structures to maintain the

[89] Robert Hicks, Bradley Parks, J. Timmons Roberts, and Michael Tierney, *Greening Aid?*, (New York: Oxford University Press, 2008): 12-14,; "Global Governance and Democratic Accountability." In David Held and Mathias Koenig-Archibugi. (ed.) *Taming Globalization: Frontiers of Governance*. (Cambridge: Polity Press, 2003) :130-159

effects of projects nor to afford enough costs of maintaining projects. Since most developing recipient countries are lack of sound tax-system and have poor macroeconomic policies, operating systems for projects are volatile, and thus need more funds to sustain projects. If not, it is matter of time until the system is abandoned. In short, the problem is exacerbated by the desire of donors to show their own taxpayers the tangible results of foreign aid programs as quickly as possible, and their interest in hiring their own citizens and firms to perform much of the work.

Another reason is that although donors successfully provide both capacity building programs for institutional development and costs for hard investment, the efforts may result in failure if the recipient countries do not commit themselves for the success of new institutions.[90] For the successful and sustainable policy outcomes, both donors and recipients must agree to work together to achieve common purposes or interests. As specified in the definition of partnership by UN General Assembly, contributing resources and competencies based on common purposes and shared interest is very crucial for a successful partnership.[91] Hence, though it is very common that the donors and the recipients have different views on a certain issue for development, they have to find intersections of purposes and interests anyway

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[90] David Fairman and Michael Ross, "Old Fads, New Lessons: Learning from Economic Development Assistance" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996): 41-49

[91] United Nations General Assembly. *Enhanced Cooperation between the United Nations and All Relevant Partners, in Particular the Private Sector*. 2003. Retrieved from http://www.gppi.net/fileadmin/gppi/Enhanced_Cooperation_between_the_UN_and.pdf. (accessed November 6, 2013): 4

in order to initiate, implement, and maintain development projects. Also, finding shared interests and purposes should be originated from the willingness of participation of both parties instead of grudging acceptance because most of successful cases of aid alignment are based on strong ownership and leadership by the recipients and donors' support.[92] The asymmetrical levels of concern for development projects between donors and recipients, usually being tilted in favor of donors, are not in proper alignment because they have different priorities.[93]

In a nutshell, alignment between donors and recipients with strong sense of ownership for capacity development and changing institutional arrangements is the very ideal condition for securing sustainability for supply of renewable energy in recipient countries. For capacity development, recipients with ownership have to put efforts to lead the course with the auspices of the donors, and on the other hands, for institutional arrangements, donors need to seize leadership with the supports by recipients. Based on this framework, this research argues that electrification by introducing renewable energy in the recipient countries through ODA is likely to be successfully sustained when those factors are satisfied.

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[92] David Fairman and Michael Ross, "Old Fads, New Lessons: Learning from Economic Development Assistance" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996): 47

[93] Robert Keohane, "Analyzing the Effectiveness of International Environmental Institutions" in Robert Keohane, and Marc Levy, (ed.) *Institutions for Environmental Aid*, (Cambridge, MA: MIT Press, 1996.): 9-10

III. Dissemination of Renewable Energy in the Recipient Countries

Based on the analytical framework discussed, this research precedes qualitative and comparative case studies for finding critical ODA policies for the success of dissemination of renewable energy in recipient countries. By intensely analyzing the capacity development of the recipients, this research intends to find institutional development components that are highly relevant to securing viability of renewable energy.

For the sake of clear test of variables, two cases from Burkina Faso and the Philippines are discussed. For each case, donor-recipient partnership puts efforts for capacity development at the individual level and the institutional level. Though the entity point is different, both partnerships expanded the course of capacity development from one level to the other. However, their policy focus for the capacity development is distinct. By following their strategies and policies for the capacity, this research finds proper policies for deployment of renewable energy in response to different conditions of respective recipient countries.

1. Burkina Faso

According to IEA, 1.3 billion people, which take about 20% of the global population, do not have access to electricity. More than 95% of the people lacking access to modern energy service are in either sub-Saharan Africa or developing Asia and 84% of them live in rural areas. Sub-Saharan Africa takes only 12% of the global population, but nearly 45% of them do not have access to electricity.[94] Burkina Faso is one of the countries suffering from the problem.

Burkina Faso is a poor, land-locked, Sub-Saharan African country that heavily relies on cotton and gold exports for revenue. Cotton and other agricultural products are main source of income, which is vulnerable to periodic drought. The country has few natural resources and a weak industrial base.[95] Against this backdrop, Burkina Faso created new socio-economic development policy with strong emphasis on the improvements of living conditions of people. According to Burkina Faso Poverty Reduction Strategy Paper (PRSP) for 2008-2012, lack of infrastructure is one of the major impediments to poverty reduction. With regard to the electricity sector, two challenges were confronted. The country was required to increase power

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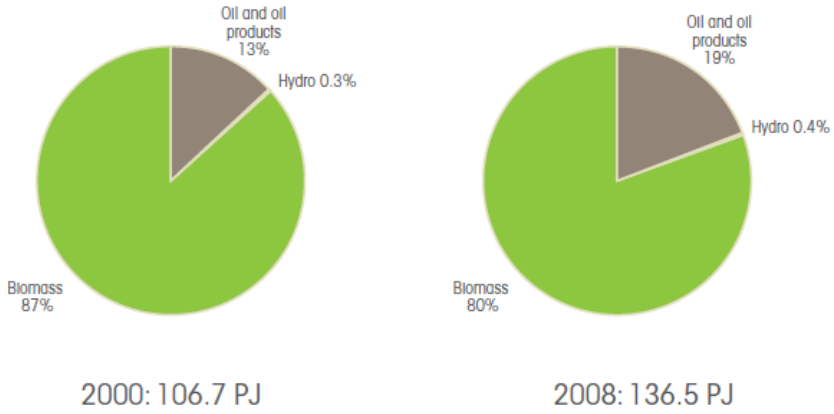
[94] OECD/IEA, *World Energy Outlook: Energy For All – Financing Access For The Poor*, (Paris: International Energy Agency, 2011):10

[95] Central Intelligence Agency, *The World Factbook: Burkina Faso*, Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/uv.html (accessed Dec 18, 2013)

supply to meet fast-growing demand, and to extend power supply to rural localities while improving the reliability and quality of overall service.[96]

Figure 7. Total Primary Energy Supply in 2000 and 2008



Source: International Renewable Energy Agency (IRENA), *Renewable Energy Country Profile: Burkina Faso,* 2010, Retrieved from www.irena.org/remaps/countryprofiles/africa/burkinafaso.pdf (accessed November 11, 2013)

To meet increasing demands, the country has increased imports of oil because the country does not have known crude oil reserves.[97] However, the government estimates that the more the country relies on oil, the more the national economy is unstable and unsustainable because its entire

[96] African Development Bank. *Project Appraisal Report: Electricity Infrastructure Strengthening and Rural Electrification Project.* 2009. Retrieved from http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Burkina%20Faso_Electricity%20Infrastructure%20Strengthening%20and%20Rural.pdf. (accessed December 15, 2013)

[97] International Renewable Energy Agency (IRENA), *Renewable Energy Country Profile: Burkina Faso,* 2010, Retrieved from www.irena.org/remaps/countryprofiles/africa/burkinafaso.pdf (accessed November 11, 2013)

consumption of oil has to rely on imports.[98] Yet, considered their weak industrial base, it is hardly expected that they can ensure national capacity for development independently using the oil imported. Also, to achieve MDG goals, renewable energy is appraised as a better source in that it contributes to diversification of the economy and improves living conditions of the overall populations.[99] The Government of Burkina Faso, African Development Bank (AfDB,) WB, and many other bilateral organizations acknowledged the situation, and have tried many development projects to achieve the goal of the government's goal in energy sector.[100]

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[98] African Development Bank. *Project Appraisal Report: Electricity Infrastructure Strengthening and Rural Electrification Project.* 2009. Retrieved from http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Burkina%20Faso_Electricity%20Infrastructure%20Strengthening%20and%20Rural.pdf. (accessed December 15, 2013) ; Dutch Foreign Ministry (DGIS), and German Ministry of International Cooperation (BMZ). *Energising Development-FAFASO: Final Technical Report*. 2007. Retrieved from http://www.cilss.bf/predas/telechargement/FAFASO%20final%20report%202nd%20version%20with%20annexes.pdf (accessed August 1, 2013)

[99] African Development Bank. *Project Appraisal Report: Electricity Infrastructure Strengthening and Rural Electrification Project.* 2009. Retrieved from http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Burkina%20Faso_Electricity%20Infrastructure%20Strengthening%20and%20Rural.pdf. (accessed December 15, 2013)

[100] Ibid.:1; Gunther Benscha, Michael Grimmb, Katharina Petera, Jörg Petersa and Luca Tasciotti, *Impact Evaluation of Improved Stove Use in Burkina Faso – FAFASO,* 2013, Retrieved from http://www.government.nl/files/documents-and-publications/reports/2013/06/20/impact-evaluation-of-improved-stoves-in-burkina-faso-substudy-by-external-consultants/bf-ics-report-20130304.pdf.

1.1. Improved Cooking Stove Project in Burkina Faso

Burkina Faso's FAFASO–"Foyers Améliorés au Faso" in English, improved stoves in Burkina Faso–is one of the projects in the same line with the goal. The project supported by a Dutch-German Energy Partnership Energizing Development (GIZ- EnDeV) which is partnership development agency financed by the Dutch Foreign Ministry (DGIS) and the German Ministry of International Cooperation (BMZ).[101] FAFASO commenced in 2006 and covered all territory of Burkina Faso, with a focus of some biggest towns where were the targets for initiating commercial markets for improved cooking stoves.[102]

The projects helped to disseminate improved cooking stoves that enhanced its biomass fuel efficiency up to 35-80% compared to traditional one. From 2006 to 2011, about 180,000 stoves were sold to households, institutions and productive units.[103] Improved cooking stoves are a mature energy technology that helps to consume biomass energy efficiently for heating and cooking. Also, it reduces amounts of smoke that fills house and

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[101] International Renewable Energy Agency (IRENA), *Renewable Energy Jobs and Access*, 2012, Retrieved from http://www.irena.org/DocumentDownloads/CaseStudies/CaseStudies_BurkinaFaso.pdf (accessed August 5, 2013)

[102] Ibid. Gunther Benscha, Michael Grimmb, Katharina Petera, Jörg Petersa and Luca Tasciotti, *Impact Evaluation of Improved Stove Use in Burkina Faso – FAFASO,* 2013, Retrieved from http://www.government.nl/files/documents-and-publications/reports/2013/06/20/impact-evaluation-of-improved-stoves-in-burkina-faso-substudy-by-external-consultants/bf-ics-report-20130304.pdf.: 4

[103] Ibid.

danger of accident whenever people make fire. For the society, it decreases pressure on forest, improves public health, and creates job opportunity for women and craftsmen who make the equipment.[104]

1.2. Zoom-out from Individual to Institutional Level for Capacity Development

As discussed in the framework, the case of Burkina Faso is analyzed in two dimensions: Individual and institutional level. GIZ-EnDeV approached to individual level as entry point instead of institutional level, which is common entry point for development projects, due to past failure experience.[105] The case of Burkina Faso demonstrates how donor agencies can address chronic problems at institutional level. By taking different entry point, GIZ-EnDeV primarily enhanced capacities of individuals who constitute institutions.

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[104] GVEP International. *DEEP-EA Technical Factsheet: Improved cook-stoves production.* 2013. Retrieved from www.gvepinternational.org/sites/default/files/factsheet_ics_web_final.pdf (accessed December 27, 2013):1

[105] International Renewable Energy Agency (IRENA), *Renewable Energy Jobs and Access*, 2012, Retrieved from http://www.irena.org/DocumentDownloads/CaseStudies/CaseStudies_BurkinaFaso.pdf (accessed August 5, 2013); Gunther Benscha, Michael Grimmb, Katharina Petera, Jörg Petersa and Luca Tasciotti, *Impact Evaluation of Improved Stove Use in Burkina Faso – FAFASO,* 2013, Retrieved from http://www.government.nl/files/documents-and-publications/reports/2013/06/20/impact-evaluation-of-improved-stoves-in-burkina-faso-substudy-by-external-consultants/bf-ics-report-20130304.pdf.: 4

Burkina Faso has been one of the leading countries among Sub-Saharan countries regarding the development and dissemination of Improved Cooking Stoves. Many donor countries engaged in the country's projects to supply improved cooking stoves since 1970s for technical assistance. Accordingly, the country had abundant technical experience, but was not able to maintain the technologies once donors left.[106] As a result, donor agencies recognized the needs for institutional setup to maintain improved technical and administrative capacities and personnel that consists of the institution.[107]

However, Ministry of Environments was contested by other ministries due to its past incompetence in the dissemination of improved cooking stoves.[108] The ministry was criticized for subsidizing renewable energy only instead of making proper policies to tackle the problem.[109] As a result, donor agencies engaged in other ministries such as Ministry of Energy in charge of WB's program for improved stoves.[110] The fragmentation within the government made donor agencies take risks of instability if they were to join partnership with ministries in Burkina Faso.

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[106] Ibid.

[107] Ibid.

[108] Energypedia. *Burkina Faso Energy Situation.* 2013. Retrieved from https://energypedia.info/wiki/Burkina_Faso_Energy_Situation (accessed November 2, 2013)

[109] Dutch Foreign Ministry (DGIS), and German Ministry of International Cooperation (BMZ). *Energising Development-FAFASO: Final Technical Report*. 2007. Retrieved from http://www.cilss.bf/predas/telechargement/FAFASO%20final%20report%202nd%20version%20with%20annexes.pdf (accessed August 1, 2013):12-14

[110] Energypedia. *Burkina Faso Energy Situation.* 2013. Retrieved from https://energypedia.info/wiki/Burkina_Faso_Energy_Situation (accessed November 2, 2013)

Accordingly, rather than taking risks at institutional level, GIZ-EnDeV decided to focus on individual level engagement. It was possible through the use of indirect subsidies after consultation with local governments for policy alignments.[111] Without clearly agreed policy, the ministry of environment, which was partner of this project and used to regard improved cooking stoves as free gifts from donors, would have not been cooperative with GIZ-EnDev. Before starting the project in Burkina Faso, GIZ-EnDev had a series of consultation with the government and realized that the failure of the Ministry of Environment had largely to do with subsidy policies. So GIZ-EnDev and the government of Burkina Faso together decided to give indirect subsidies supporting research and development activities to different degrees and trained producers or trainers in the production of efficient stoves.[112] Activities have also included promotional campaigns and awareness creation. The projects have supported the development, introduction and institutionalization of quality standards and certifications.[113]

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[111] Dutch Foreign Ministry (DGIS), and German Ministry of International Cooperation (BMZ). *Energising Development-FAFASO: Final Technical Report*. 2007. Retrieved from http://www.cilss.bf/predas/telechargement/FAFASO%20final%20report%202nd%20version%20with%20annexes.pdf (accessed August 1, 2013):4-6; Gunther Benscha, Michael Grimmb, Katharina Petera, Jörg Petersa and Luca Tasciotti, *Impact Evaluation of Improved Stove Use in Burkina Faso – FAFASO,* 2013, Retrieved from http://www.government.nl/files/documents-and-publications/reports/2013/06/20/impact-evaluation-of-improved-stoves-in-burkina-faso-substudy-by-external-consultants/bf-ics-report-20130304.pdf.: 4

[112] Ibid.; International Renewable Energy Agency (IRENA), *Renewable Energy Jobs and Access*, 2012, Retrieved from http://www.irena.org/DocumentDownloads/CaseStudies/CaseStudies_BurkinaFaso.pdf (accessed August 5, 2013)

[113] Dutch Foreign Ministry (DGIS), and German Ministry of International

In this way, two thirds of the overall budget of USD 3.2 million by 2011 flowed into training and marketing efforts to build capacities of individuals.[114] By the end of 2010, FAFASO had trained a total of 729 people, including metal smiths, masons, and potters. Even though some of the numbers could not be considered as the creation of new jobs, rather, the individuals concerned were experienced craftsmen. The training offered them to have higher qualifications and an opportunity for a sustained role, and many of the metal smiths and masons employed apprentices. As part of the training, all producers are also taught to calculate the prices for the stoves as well, putting them in a better position in markets.[115]

A series of trainings for individuals' capacity development expended to creation of new institutions. Markets for improved cooking stoves and research institute to sustain the improved qualities of technology were created. On the one hand, the creation and maintenance of market and the sustenance of adaptable-tech renewable industry were largely due to the supply of skillful craftsmen with technological knowledge and business skills, even though commercial chain had not yet emerged so far. Most deals were still made directly. However, thanks to them, the stoves were produced domestically, in

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Cooperation (BMZ). *Energising Development-FAFASO: Final Technical Report*. 2007. Retrieved from http://www.cilss.bf/predas/telechargement/FAFASO%20final%20report%202nd%20version%20with%20annexes.pdf (accessed August 1, 2013):17-28

[114] Ibid. International Renewable Energy Agency (IRENA), *Renewable Energy Jobs and Access*, 2012, Retrieved from http://www.irena.org/DocumentDownloads/CaseStudies/CaseStudies_BurkinaFaso.pdf (accessed August 5, 2013)

[115] Ibid.:17-28

a decentralized, small-scale fashion. In general, the materials used were indigenous. Previously imported scrap metal is now locally procured. Women, who used to suffer from collecting charcoals and woods, are now able to engage in small professional activities such as preparation of cookies, creating pottery thanks to reduced fuel expenses. Among households, fuel savings from improved cooking stoves use have allowed improvements in diet as well.[116]

On the other hand, the Institute of Research in Applied Sciences and Technologies (IRAST) under the department of the Ministry of Secondary Schools and Research created a new department for quality control due to the request and contract by GIZ-EnDev.[117] Though it does not have administrative capacities to manage policies relevant to the stoves, on the research and technology side, it is the only institution capable to accredit improved stoves and defining stove standards.[118]

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[116] Ibid.

[117] Dutch Foreign Ministry (DGIS), and German Ministry of International Cooperation (BMZ). *Energising Development-FAFASO: Final Technical Report*. 2007. Retrieved from http://www.cilss.bf/predas/telechargement/FAFASO%20final%20report%202nd%20version%20with%20annexes.pdf (accessed August 1, 2013):4-8

[118] International Renewable Energy Agency (IRENA), *Renewable Energy Jobs and Access*, 2012, Retrieved from http://www.irena.org/DocumentDownloads/CaseStudies/CaseStudies_BurkinaFaso.pdf (accessed August 5, 2013); Gunther Benscha, Michael Grimmb, Katharina Petera, Jörg Petersa and Luca Tasciotti, *Impact Evaluation of Improved Stove Use in Burkina Faso – FAFASO,* 2013, Retrieved from http://www.government.nl/files/documents-and-publications/reports/2013/06/20/impact-evaluation-of-improved-stoves-in-burkina-faso-substudy-by-external-consultants/bf-ics-report-20130304.pdf.: 4

1.3. Technological Advance of Improved Cooking Stoves in Burkina Faso

With regards to technological advance, the case of Burkina Faso is very successful. GIZ-EnDev started their engagement from individuals who consists of institutions based on agreement with the Ministry of Environment. At individual level, the donor provided chances of learning processes such as workshop or training sessions for the local craftsman. Then, the local craftsmen employed apprentice, which can be interpreted as on-the-job training for them. Both craftsmen and apprentice were also able to do learning-by-doing. The creation of markets due to inflow of skillful craftsmen in the end made innovation in the context of developing countries by new methods of production, new sources of supply, the exploitation of markets, and new ways to organize business with strong sense of ownership. At institutional level, donors at micro-level exercised meta-power for capacity development. The establishment of a department within the research institution, IRAST, through interaction with the donor, made the government be able to control qualities and sustain improved technologies. Also the new market where local people internalize technologies was improved by donors in the beginning and IRAST continuously in the longer term.

However, there still remain limitations to deployment of improved cooking stoves in Burkina Faso. The project only tackled technical advancement, but did not involve strategies for administrative capacity

development. Now the government is capable of controlling qualities of the equipment by IRAST, but in terms of policy making, the fragmentation between government ministries is still severe so that it rarely makes aligned policy for further development and management of the stoves. The country requires further capacity development for ensuring administrative capacity development for stabilization of improved cooking stoves to be a genuine part of national industries.

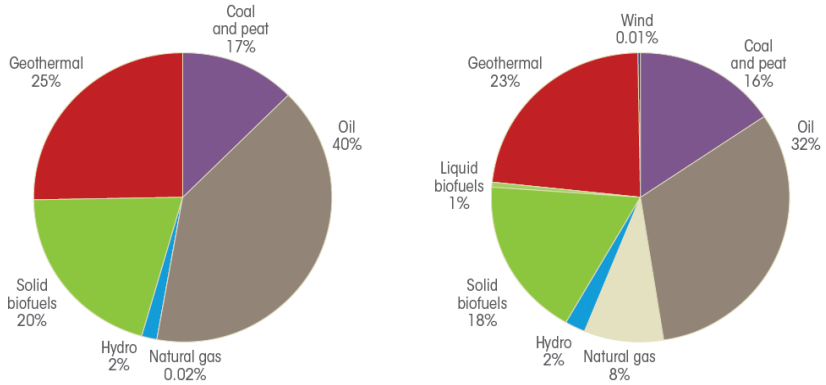
2. The Philippines

The Philippines is a developing country in Asia with the aims of the annual GDP growth rate of 6-7%. Their economy has largely relied on domestic consumption and remittances from overseas Filipino workers, but now the government plans to expand outsourcing industry.[119] To achieve this goal, however, the government wants to utilize renewable energy with heterogeneous levels of technology. It is well reflected in three energy sector objectives out of four: 1) ensuring sufficient, stable, secure, accessible and

[119] Central Intelligence Agency. *The World Factbook: Philippines*. 2013. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html (accessed Dec 23, 2013).

reasonably-priced energy supply; 2) pursuing cleaner and efficient energy utilization and clean technologies adoption; 3) empowering and protect welfare of various energy publics.[120] Particularly the last goal has to do with MDGs, and is expected to be achieved by installation of renewable energy with adaptable technology. The government practically has implemented energy policies to achieve the goals in the recent decade, so the consumption of fossil fuels has declined 12% in total energy consumption with various energy sources.[121] (See figure 8.)

Figure 8. Total Primary Energy Supply in 2000 and 2009



Source: International Renewable Energy Agency (IRENA), *Renewable Energy Country Profile: Philippines,* 2010, Retrieved from www.irena.org/remaps/countryprofiles/asia/philippines.pdf (accessed November 13, 2013)

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[120] Philippine Department of Energy. Energy Sector Objectives, RE Goals, Policies and Strategies. 2013. Retrieved from http://www.doe.gov.ph/doe_files/pdf/04_Energy_Resources/energy%20sector%20objectives.pdf

[121] International Renewable Energy Agency (IRENA), *Renewable Energy Country Profile: Philippines,* 2010, Retrieved from www.irena.org/remaps/countryprofiles/asia/philippines.pdf (accessed November 13, 2013)

The Philippines has some rationale to prefer renewable energy to fossil fuels. The first reason is the geographical characteristics. The country is composed of 7,101 islands, which brings the difficulties to deliver the electricity through grid system to all areas of the country due to high cost and technological demonstration.[122] As a result, harnessing and utilizing renewable energy, which does not require centralized grid system, comprises critical strategies of the government to provide energy supply for the entire country.[123] As a part of rural electrification efforts, the government plans wide-scale use of solar, micro-hydro, wind and biomass resources.[124] The second reason is decreasing reliance on imported fossil fuels. It is the government's policy to facilitate the energy sector's transition to a sustainable cycle with renewable energy. The shift from fossil fuel sources to renewable energy as an increasingly prominent, viable and competitive fuel option is a key strategy to ensure success of this transition.[125] The government of the Philippines regards its economy is highly vulnerable to change in prices of oils, coals and natural gas, as roughly two-thirds of the country's energy

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[122] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):1

[123] Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects*. 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013): 1

[124] Ibid.; Philippine Department of Energy. Renewable Energy. 2013. Retrieved from http://www.doe.gov.ph/renewable-energy-res (accessed October 24, 2013)

[125] Ibid.

production depends on fossil fuels.[126] Also, the country has great potential for developing various scales of hydropower across entire territory.[127]

Figure 9. Micro-hydropower Potentials in Philippines

Source: Philippine Department of Energy. Micro-hydro Potentials in the Philippines. 2013. Retrieved from http://www.doe.gov.ph/renewable-energy-res/resource-maps/276-micro-hydro (accessed November 8, 2013)

Potential sites for mini and micro-hydro projects are evenly distributed in all the regions. (See figure 9.) The National Electrification Administration (NEA), National Power Corporation (NPC) and the

[126] Worldwatch Institute. *Philippines maps out plan to switch to 100 percent renewables in 10 year.* 2013. Retrieved from http://www.worldwatch.org/philippines-maps-out-plan-switch-100-percent-renewables-10-years.

[127] Philippine Department of Energy. Renewable Energy. 2013. Retrieved from http://www.doe.gov.ph/renewable-energy-res (accessed October 24, 2013)

Department of Energy (DOE) studied specific mini-hydro potential sites and lined them up as indicative projects. The NEA, NPC, and DOE respectively have identified about 1,000 mini-hydro potential sites for development based on its mini-hydro program which began in the 1980s.[128] Likewise, donor agencies also conducted survey on hydro energy potential of the country and found the similar results illustrating that potential sites are well distributed all over the regions.[129]

Given the country's vast hydropower potential, more than 10 percent of electricity requirements are aimed to be supplied by hydropower generation by large, mini, and micro hydro power. [130] To meet the estimated increase in demand for energy, committed and indicative capacity additions is expected to increase overall hydropower available capacity to 5,468 MW from the current installed capacity of 2,518 MW within both grid and off-grid areas.[131] Though 18 large hydropower potentials are estimated to account for more than 90 percent of the possible additional capacity, the remainder supplied

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[128] Ibid.

[129] United States National Renewable Energy Laboratory (US-NREL). Assessment of Micro-Hydro Resources in the Philippines. 2000. Retrieved from http://spug.ph/Mcro-hyd.pdf (accessed December 25, 2013)

[130] Hydro plants are classified based on their capacities, as follows: (i) micro-hydro - 1 to 100 kW; (ii) mini-hydro - 101 kW to 10 MW; and (iii) large hydro - more than 10 MW. The total untapped hydropower resource potential of the country is estimated at 13,097 MW, of which 85 percent are considered large and small hydros (11,223 MW), 14 percent (1,847 MW) are classified as mini-hydros while less than 1 percent (27 MW) are considered micro-hydros.

[131] Philippine Department of Energy. Renewable Energy. 2013. Retrieved from http://www.doe.gov.ph/renewable-energy-res (accessed October 24, 2013)

by mini-hydro potentials is still important in that it is the source of energy for the 10% of the population without access to electricity.[132] These micro-hydropower plants were planned to support the government's rural electrification program targeting 100 percent barangay,[133] or village electrification by 2006.[134]

2.1. Micro and Mini-hydropower Project in the Philippines

'Sustainability Improvement of Renewable Energy Development in Village Electrification' was a project initiated by Japan International Cooperation Agency (JICA) and DOE from June 2004 to June 2009. The Barangay Electrification Program (BEP) had a long history, and was one of the core policy areas that the country takes care of for rural electrification. Renewable Energy Management Division (REMD) of DOE was responsible for the program, which promoted the barangay electrification utilizing the

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[132] Ibid. International Renewable Energy Agency (IRENA), *Renewable Energy Country Profile: Philippines,* 2010, Retrieved from www.irena.org/remaps/countryprofiles/asia/philippines.pdf (accessed November 13, 2013)

[133] Barangay is a native term meaning village, and actually is the smallest administrative division in the Philippines.

[134] Philippine Department of Energy. Renewable Energy. 2013. Retrieved from http://www.doe.gov.ph/renewable-energy-res (accessed October 24, 2013)

renewable energy, specifically micro-hydro and solar system. However, the previous programs were often breakup whenever donors left, and despite a series of failure of projects, DOE in charge of evaluation and approval of energy policy was not able to indicate the exact problem because they were not prepared with enough capacities to examine the problems. Thus JICA joined a partnership with GOP to support dissemination of micro- and mini-hydropower and to address sustainability problems in cooperation with DOE.[135]

2.2. Zoom-in from Institutional to Individual Level for Capacity Development

The case of the Philippines is analysed in two dimensions: Institutional and individual level. JICA targeted institutional level as initial entry point which is common entry point for other development projects as well. It clearly descripted the purpose of the projects is enhancing capacity of target institutions to promote and manage sustainable renewable energy based village electrification. Through this, JICA expects to achieve the goal of

[135] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013)

capacity development that is to tackle chronic problems or breakup after donors' leaving and secure sustainability in terms of both technology and management.[136]

JICA and GOP agreed that expansion of renewable energy sources for rural electrification is necessary to achieve the goal of social development, and not only technical demonstration but also managerial capacity development are important for securing sustainability.[137] Based on these shared interests and objectives, JICA actively conducted a series of consultation from preparatory phase. It consulted with local governments and communities, and surveyed household to find the demands of local people. These efforts were continued until the end of projects. Based on the information accumulated through the consultations, both JICA and DOE aligned their strategies and policies together for the dissemination of micro- and mini-hydropower, and organized the proceedings of the entire projects.[138] (See figure 10.)

As mentioned above, JICA and GOP fully agreed that past experience of breakup of micro hydropower had to do with lack of technical skills and managerial capabilities to sustain the improved infrastructure given

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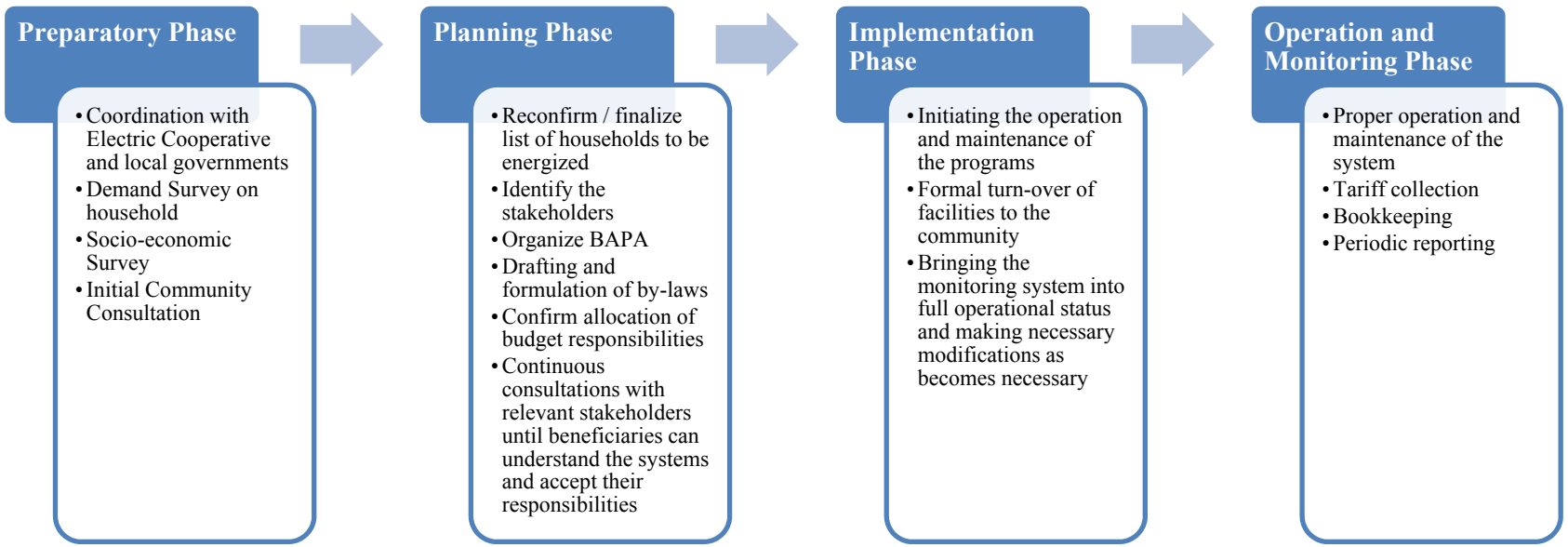
[136] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):1-2

[137] Ibid.:3-4

[138] Ibid.; Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects.* 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013):5-6

Figure 10. The Process of Renewable Energy Rural Electrification



Source: Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects*. 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013):5-9

by donor. Barangay Power Association (BAPA) was established to tackle the problem. BAPA is defined as 'a group of duly recognized officers and members, held together by duly approved by-laws under the auspices of a General Assembly. The by-laws are binding documents which are used in the operation of the system.'[139] In other words, it is an official institution accredited by national law, created through the interactions between JICA and GOP. JICA had to repeat numerous workshops and consultations on a preparatory phase until GOP had confidence on the relevance of BAPA.[140] BAPA not only takes care of the technical maintenance of renewable energy system within a designated area, but also coordinates with local governments and council and the Barangay general assembly for administration. As a legally independent institution, it also discuss BAPA Constitution, elect BAPA officers, and conduct training sessions for continuous capacity development for themselves.[141]

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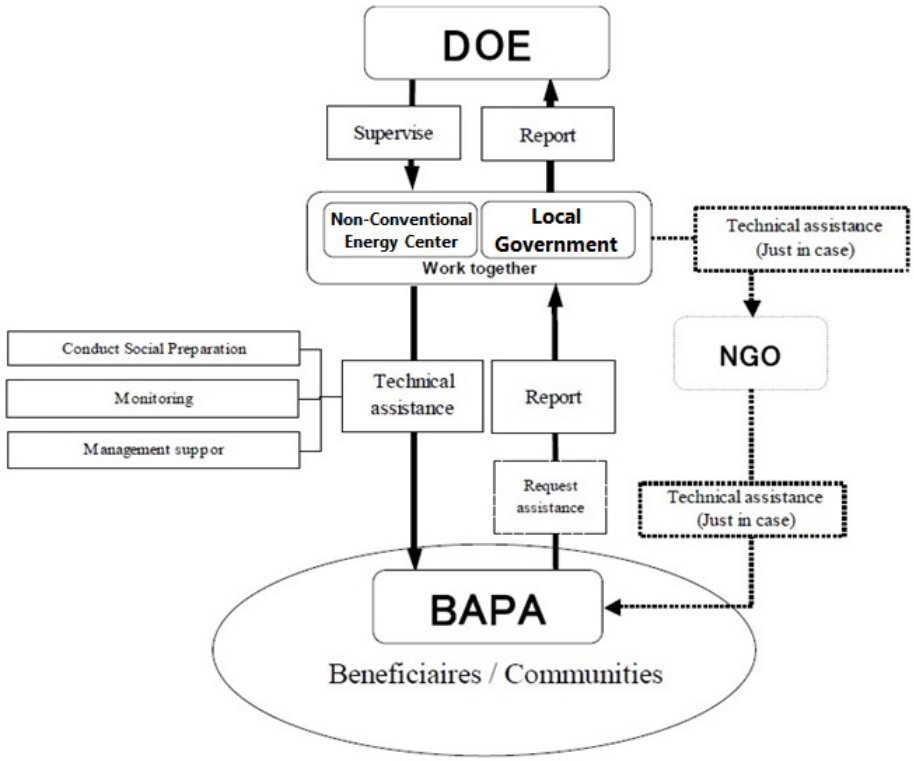
[139] Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects.* 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013):10

[140] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):3

[141] Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects.* 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013):10-11

Figure 11. Cooperation System of BAPA

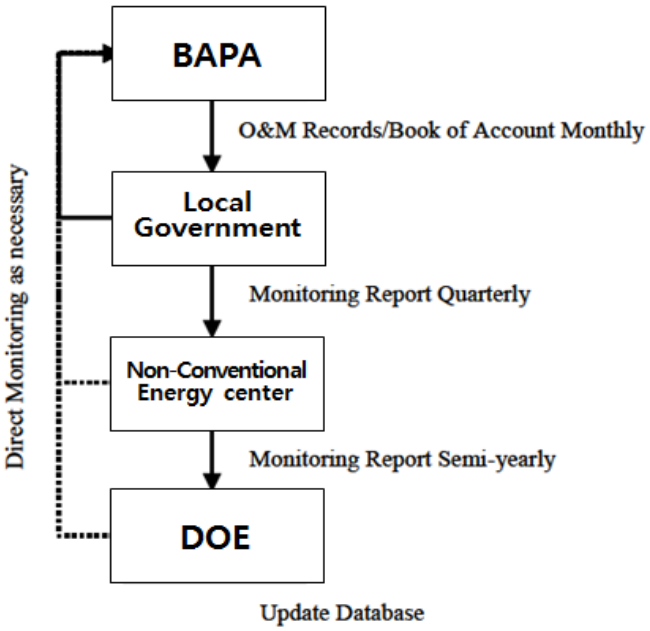


Source: Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects.* 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013):12

GOP also continuously utilized the monitoring framework which is originally organized for Memorendum of Agreement. As GOP acknowledged the importance of monitoring and evaluation system to learn from experience, it created a guideline for monitoring, "Guideline for Monitoring and

Management of Renewable Energy Projects for Rural Electrification."[142] Though the framework is still in progress to collect more information and indicators, and environment to use the framework is immature due to low level of awareness and understanding about evaluation and monitoring, it is

Figure 12. Monitoring Flow for Renewable Energy in GOP



Source: Philippine Department of Energy. *Guideline for Monitoring and Management of Renewable Energy Projects for Rural Electrification*. 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/a5186e6880c2a11d4925767b000dd6d5/$FILE/G-2.pdf. (accessed October 28, 2013):3

[142] Philippine Department of Energy. *Guideline for Monitoring and Management of Renewable Energy Projects for Rural Electrification*. 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/a5186e6880c2a11d4925767b000dd6d5/$FILE/G-2.pdf. (accessed October 28, 2013)

meaningful that the guideline is voluntarily drafted by the recipient government through the course of capacity development.[143]

Having directed policies to tackle problems at institutional level, the partners zoomed into individual level. In the beginning, JICA's training was limited to knowledge transfer through technical exercises, seminars, workshops, short lectures and coaching during practical training activities.[144] What made the difference was hands-on experience of government officers and local people as part of BAPA or DOE field offices.[145] As the government officers operate the institution, they had opportunities to practice what they learned at training sessions.[146] For example, they were able to comprehend techniques for trouble shootings, and realized necessity of monitoring and evaluation for further improvements.[147]

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[143] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):3

[144] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):1-2

[145] Ibid.

[146] Philippine Department of Energy. *Training Manual for Micro-hydropower Technology*. 2013. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/3b8a2d403517ae4549256f2d002e1dcc/b7dab041264144364925767a0024703d/$FILE/MHP-6.pdf (accessed October 25, 2013)

[147] Ibid.; JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):1-2

2.3. Technological and Managerial Capacity Development for Micro-hydropower in the Philippines

The Philippines' case of capacity development for micro-hydropower has uniqueness for some reasons. First of all, the goal of the project was securing sustainability of micro-hydropower after the donors finish assistance. The accumulated past failure experience encouraged the recipient to have strong ownership for the project because the success of the project had quite large possibilities of determining the country's energy policy for the future.[148] Against this backdrop, the partners were actively engaged in the projects.

Second, being different from the strategies of Burkina Faso, they decided to tackle lack of both technological and administrative capacity problems. Through the prior consultations with GOP, local government and people, the partners acknowledged the necessities of addressing both difficulties, so they planned entire projects in response to the recipient's needs.[149] Accordingly, JICA's engagement at institutional level resulted in

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[148] Philippine Department of Energy. Energy Sector Objectives, RE Goals, Policies and Strategies. 2013. Retrieved from http://www.doe.gov.ph/doe_files/pdf/04_Energy_Resources/energy%20sector%20objectives.pdf

[149] JICA, *Sustainability Improvement of Renewable Energy Development in Village Electrification,* 2008, Retrieved from http://www.jica.go.jp/english/our_work/evaluation/tech_and_grant/project/term/asia/c8h0vm000001rr8t-att/phil2008_02.pdf (accessed November 1, 2013):1-2; Philippine Department of Energy. *Guide on Social Preparation for Renewable Energy-based Electrification Projects.* 2009. Retrieved from

the establishment of a new institution, BAPA, in charge of both technical maintenance and policy coordination with the central and local government. JICA's exercise of meta-power for the new institution ultimately changed rules of game in the recipient country because the new institution became a focal institution for micro-hydropower. GOP then connected the layers of government institutions with BAPA. For example, newly organized policy framework for monitoring and evaluation also begins from BAPA which takes role of a primary source of information.[150]

At individual level, initial phase of project was limited to primary level of knowledge transfer for technology and management, but BAPA and other field offices provided chances for government officer and local community to comprehend and internalize knowledge through hands-on experience. BAPA for the effective deployment of micro-hydropower for rural electrification not only supported connection of electricity for local people but created job positions for them, which is in the same vein with the social development and the MDGs.

Third, capable institution filled with capable human resources made a series of technical manuals for hydro-power and guidelines for management

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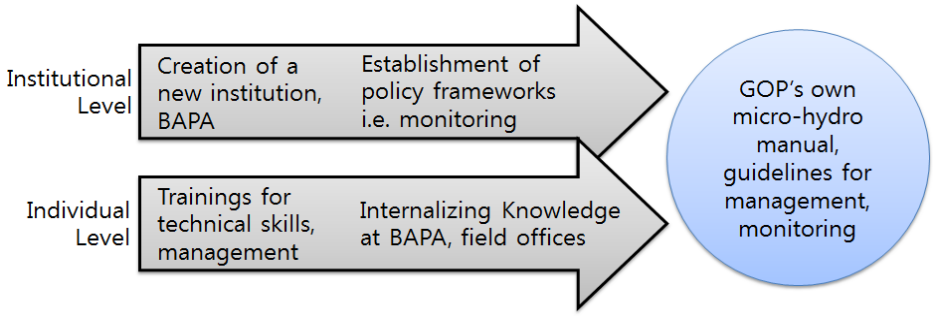
http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/598c938efc388ba84925767b0012a03f/$FILE/Guide_on_social_preparation.pdf (accessed October 27, 2013):5-6

[150] Philippine Department of Energy. *Guideline for Monitoring and Management of Renewable Energy Projects for Rural Electrification*. 2009. Retrieved from http://gwweb.jica.go.jp/km/FSubject0901.nsf/03a114c1448e2ca449256f2b003e6f57/a5186e6880c2a11d4925767b000dd6d5/$FILE/G-2.pdf. (accessed October 28, 2013)

of infrastructure, human resources, and monitoring and evaluation.[151] Considered the perception that the recipient countries do not have enough technological and administrative capacities to develop and maintain renewable energy, the publication by DOE is quite surprising in that they have the level of knowledge to publish official papers.

Figure 13. Two-level Approach for Capacity Development in the Philippines



On the other hand, GOP also has challenges ahead. Though bad perception toward hydropower is only relevant to large hydropower, the government was sometimes required to persuade local people for its usefulness in life and less harmfulness toward environment. Also, a

[151] DOE published guidelines and manuals for local government, officers, community members, even for donors who have plan for engage in partnership for renewable energy after the project. The list of publications are as following: 'Empowering the Nation through Renewable Energy,' 'Guide on Social Preparation for Renewable Energy-based Electrification Projects,' 'Guideline for Monitoring and Management of Renewable Energy Projects for Rural Electrification,' 'Manuals and Guidelines for Micro-hydropower Development in Rural Electrification,' 'Training Manual for Micro-hydropower Technology.'

compensate source of energy for considerable decrease in power generation during summer month was required due to its run-of-river mechanism. Introduction of market system for the industry as a part of national economy and the production of all components of equipment is the next goal of the government.[152]

Table 4. The Process of Capacity Development of the Recipients

		Burkina Faso	The Philippines
Individual Level	**Knowledge transfer**	- Seminars and workshops - Trainings for craftsmen	- Technical training - Seminars and workshops
	Learning by doing	- Trained local craftsmen working at markets - Apprentice hired by the craftsmen	- Government officers and local people working at BAPA
	Innovation	- New methods of production - New sources of supply - Exploitation of markets - New ways to organize business	- New ways to organize business
Institutional Level	**Behavior of donor agencies**	- Relational power	- Meta power
	New Institutions	- Contract with IRAST - Market system	- BAPA - Monitoring framework
	Policy outcomes	- Quality control for equipment - Standard creation and management	- Technical manual - Guidelines for management and monitoring

[152] Philippine Department of Energy, *Empowering the Nation through Renewable Energy*, 2013, Retrieved from http://www.doe.gov.ph/renewable-energy-res. (accessed October 27, 2013)

IV. Conclusion

This research has analyzed the process of capacity development to address lack of institutional development component for the sustainable viability of renewable energy in recipient countries. ODA policies aligned between donors and the recipients mainly engage into two layers of capacity development, the individual and the institutional level. Entry point for engagement itself does not matter critically. Rather, at the individual level, as observed from the case of Burkina Faso, continuous innovation by owners in the context of developing worlds is more important as far as they comprehend knowledge transferred and internalize it fitting into local context. At institutional level, donors' leadership is relatively more required. Their initiative contributes to structuring a basis for a new institution with capacity through interactions with the recipient, which consequently influence on effective policy making by the recipient government.

This comparative case study has two implications for policy makers and scholars as below. First, the process of capacity development in this research could be utilized as guidelines. Analytical framework and case studies tried to make standards for better analysis, and discussed what efforts

are required from which actors for better capacity development at each level. And two cases studies fitting into the analytical framework are turned out to be successful not only in terms of the short-term improvement of the individual and institutional capacity but also independent sustainability of the projects even after donors left.

Second, another finding from this comparative study is that renewable energy is more sustainable if both technological and managerial capacities are developed simultaneously than in the case when only one of them is improved. As introduced, their common bothersome trouble was slight possibilities of sustaining renewable energy after the project is over. The infrastructure was usually breakup because the recipients did not demonstrate capacities for maintenance. From the same problem, two cases took different paths: one is focusing on technological capacity, and the other is addressing both technological and administrative capacity. However, it is quite obvious that the latter one has carried on the assignment better. Specifically, despite the creation of the market system, as the government of Burkina Faso does not have capacities to control it, it requires subsidies to sustain and advice for policies to control the system. On the other hand, though the Philippine still struggles with some problems such as entire local production of equipment, GOP now is able to independently direct policies, and has techniques for trouble-shooting. External assistance is helpful but not a necessary condition to the Philippines anymore.

Yet, this research also has some limitations. First of all, the study is

conducted indirectly via documents in a foreign country, so there are possibilities of missing actual situation how renewable energy is operated in each country. Second, as the study eliminates the third layer of capacity building called society level or enabling environment, the interactions of individuals and institutions with the society was hardly descripted. These limitations require further studies for finding better approach for capacity development.

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Abstract in Korean

재생에너지 공급을 위한 공적개발원조 정책 비교 연구:

수원국의 역량 개발을 중심으로

최 나 은

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국제학과 국제협력전공

최근 적정 기술을 활용한 재생에너지의 공급이 보편적 에너지 접근(Universal Access to Energy)이라는 기치 아래 공여국들의 관심을 다시금 받고 있다. 그러나 최빈국들(Least Developed Countries)과 개도국들(developing countries)에 대한 재생에너지 공급은 과거 큰 실패의 경험이 있음에도 불구하고 그 이유에 대한 충분한 연구가 이루어지지 않아 개선 방안 역시 불분명하다.

따라서 본 논문은 재생에너지 공급의 주요 요소 중 그간 현저히 높은 실패율을 보인 제도적 발전(institutional development) 요소를 분석하기 위해 개발 분야의 국제연합개발계획(UNDP)에서

활용하고 있는 역량 개발(capacity development) 전략 및 역량 측정 틀(capacity assessment framework)을 적용하였다. 이를 부르키나 파소(Burkina Faso)와 필리핀(the Philippines)의 사례를 통해 살펴봄으로써 제도를 구성하고 있는 기관과 개인들의 역량 개발이 공적개발원조(ODA)를 통한 재생에너지 공급의 성공 및 지속성 확보에 어떠한 영향을 주었는지 추적하였다.

이를 통해 본 논문은 최빈국들과 개도국들의 발전 기반으로서 적정 기술을 활용한 재생에너지 공급의 타당성을 확인하였다. 또한 공적개발원조를 통한 재생에너지 공급 방안을 실제 역량 개발 사례를 통해 분석함으로써 저개발국 발전을 위한 에너지 보급 논의에 기여하고자 하였다.

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주요어: 공적개발원조(ODA), 재생에너지, 적정기술, 보편적 에너지 접근(Universal Access to Energy), 제도, 역량 개발(Capacity development), 지속성

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