Reconciling Multi-Scale Energy Development Approaches and Systems: Myanmar's Emerging Potential for An Integrated Energy Future

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As Shoon So Oo and I ate lunch together at a tidy and attentively staffed Thai restaurant somewhere in Yangon, we discussed the state of electrification efforts in Myanmar. I expressed how difficult it was to keep track of all of the different individuals, organizations, networks and institutions involved in the process.

"It's like a detective case," he said. It was a truly spot on assessment.

The process of researching this topic, traveling to Myanmar and writing this paper has been one of the most absorbing, overwhelming, exhilarating and difficult academic endeavors I have ever embarked upon. While this wasn't my first experience with international research, it was certainly the first time I had attempted it on my own. Thankfully, I was supported by amazing people every step of the way. Without the guidance and networking help of Sam Shugart and Nway Khine I would never have made it to Myanmar. The same can be said for Marlon Jimenez, who put up with my last minute requests for funding and came through for me in so many ways. The cast of characters in Myanmar was equally amazing and incredibly generous both in their donation of time and willingness to engage with me about this topic: Patrick Pawletko, Shoon Oo Se, Mamoru Sakai, David Allan, U Khun Kyaw, I am indebted to you in many ways. I'd also like to extend my gratitude to the staff of the Lil Yangon Hostel, who were the source of constant smiles and made me feel comfortable and safe during my time on the other side of the planet.

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GLOSSARY OF ACRONYMS

ADB - Asian Development Bank

CEI - Columbia Earth Institute

CGS – Centralized Grid System

DER – Distributed Energy Resource

DES – Distributed Energy System

DRD - Department of Rural Development

FF - Fossil Fuel

GOM - Government of Myanmar

IMF - International Monetary Fund

IO - International Organization

JICA - Japan International Cooperation Agency

MLFRD - Ministry of Livestock, Fisheries and Rural Development

MOEP - Ministry of Electric Power

NEMC – National Energy Management Council

NEP - National Electrification Plan

NGO - Nongovernmental Organization

NLD - National League for Democracy

NUP – National Unity Party

PSV – Power Sector Vision

RE - Renewable Energy

REAM - Renewable Energy Association Myanmar

SHPAM – Small Hydropower Association Myanmar

USDP - Union Solidarity and Development Party

WB - World Bank

WWF – World Wildlife Fund

ABSTRACT

In the following paper I explore how top-down and bottom-up development approaches generally support different energy infrastructure models. Renewable energy-based distributed energy systems (DES's) have emerged as a product of bottom-up development in the developing world, yet are hindered by centralized top-down development approaches that reflect the embedded ideologies of international organizations, as well as by inefficient or regressive domestic government policies. With this theoretical framework in mind, the paper then seeks to define how a mesolevel development approach can reconcile the advantages and disadvantages of the top-down and bottom-up approaches, through a case study of Myanmar's current national electrification efforts. By examining ways that the mesolevel approach could be applied in that situated context, one can begin to understand the necessary steps and considerations needed to efficiently develop networks of DES's and transition away from centralized grid systems (CGS's) towards a decentralized, multi-source Smart Grid.

INTRODUCTION

Turn on a light. Plug in a laptop. Open a refrigerator. These innocuous acts represent the miniscule tail end of a massive process, a network of people, places and resources that came together at a certain time and in a certain way to bring the miracle of electricity into daily life. As is the tendency with most modern conveniences in the United States and other parts of the developed world, this process, this service, this miracle has been largely taken for granted. Energy infrastructure has become an abstraction so far removed from the researchers who propose solutions, politicians who authorize policy, the engineers who extract energy, and the laborers that built capacity, that it is nearly impossible to imagine the bounds of its genesis story. Electricity has forever altered our world, yet the flick of a switch requires as much thought as the blink of an eye.

That is, it requires as much thought as the blink of a *priviliged* eye. The truth of the matter, the global truth, is that over a billion people in the year 2016 live without consistent access to electricity and the slew of immeasurable benefits that come with it (IEA 2015). While energy infrastructures in the developed world have been widely established for decades, there are many countries still struggling to develop their networks and level the energy playing field for their whole population. These electrification processes, like the processes that came before them in the developed countries, involve an incredibly complex network of actors, both domestic and international, that operate in unique ways and produce unique outcomes. However, the timing of their development needs situates these developing countries within a rapidly changing framework of ideas, therefore granting them the potential to produce exciting and progressive outcomes that could avoid the pitfalls of older development strategies (Fraser et al. 2006).

Myanmar is an interesting example of a developing country that is still largely without a comprehensive national energy infrastructure, yet is now poised to make immense progress in this direction. It is a country emerging from several decades of political and economic isolation, a period that has set it significantly behind the rest of the world in many areas of its infrastructure development (Ross 2015). However, over the last few years Myanmar has been taking its first bold steps towards democratization and integration into the global economy. After achieving a landslide victory in a November 2015 election, longtime democracy activist Daw Aung San Suu Kyi and her hugely popular political party, the National League for Democracy (NLD), now find

themselves leading a democratically elected government that must transition out of the old ways and chart a new course for Myanmar's future (Reuters Breakingview 2016).

A major step in this process has been the development of a National Electrification Plan (NEP), an ambitious project that hopes to bring electricity to nearly 60 million people in Myanmar by 2030 (Castalia Strategic Advisors 2014). It represents a rare example of massive energy infrastructure development that need not circumvent existing structures; in essence, Myanmar is more or less a clean slate for energy development. While the NEP is certainly a welcome policy for Myanmar's rural population, questions abound about whether the NEP was formed in accordance with feasible economic principles, whether it represents the voices and desires of the people of Myanmar, whether it is overly cautious in its assessment of renewable energy (RE) potential, and whether it will promote a sustained movement towards clean energy[1]. The NLD has many stated goals and positions towards energy development in the context of climate change, yet there are also questions as to whether it will be able to deliver on its promises (National League for Democracy 2015). The fledgling government faces the massive task of restructuring the national government, which will be complicated by the pressure of massive investments from multilateral lenders, ethnic conflicts throughout the country, and intense scrutiny and expectations from the populous (Myint 2016). For the purposes of this paper, the main concern is whether the

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[1] David Allan (Spectrum SDKN) in discussion with the author, March 2016

[2] All information within this section was condensed from the Encyclopedia Brittanica, in an effort to provide an unbiased perspective.

[3] *Our Common Future* (1987) defines sustainable development as "development that meets the needs of current

NLD can maintain its stated sustainability and social equity goals as it manages investments in energy infrastructure from international organizations and multilateral lenders such as the World Bank, Asian Development Bank, and the Japan International Cooperation Agency. This will require a balancing of the top-down institutional development approach, which these actors very much represent, with the bottom-up development approach, a paradigm that is far more flexible in its ambitions and interpretations of development (and intentionally so) (Fraser et al. 2006).

Myanmar is a considerably resource-rich country, and several reports by major development banks and firms have identified significant potential for these resources to be explored, extracted and utilized in the energy generation process (Asian Development Bank 2015). While hydropower resources make up the majority of Myanmar's current energy mix, followed by natural gas-powered power plants, international fossil fuel (FF) companies have been pressuring the Government of Myanmar (GOM) to allow them the freedom to tap into the country's resources, with several already pushing to ink long-term contracts . At the same time, major hydropower development has been met with vocal criticism from Myanmar's rural communities, as these projects often lead to displacement and ecological degradation while providing them little benefit (Herman 2015).

In the face of rising global temperatures and a wealth of knowledge about the health dangers of localized FF pollution, it may be in Myanmar's best interest to rigorously pursue decentralized renewable energy development (excluding major hydro)

at a much larger scale than is currently being called for in the NEP. As it turns out, there is already a wealth of knowledge in this field within the country that has been built up privately by independent power producers and engineers over the last few decades (Ross 2015; Department of Rural Development 2016). Unfortunately, political and economic conditions in Myanmar (up until very recently) have limited the potential of these projects: the small national grid is massively subsidized, the bureaucracy of RE research and development is comically bloated and dysfunctional, and independent small-scale producers (SSP's) lack the coordination or regulatory structure to attract investment (Greacan, 2014).

There are many complex ethical questions surrounding this debate, such as whether Myanmar and other developing countries should have to forgo fossil fuel development when the developed world has benefitted so strongly from them. However, in the context of rapidly developing renewable technologies, a Smart Grid composed of integrated community energy systems backed by renewables may be the most viable option for this fledgling government, as they have minimal environmental impact, will more easily facilitate the electrification of hard-to-reach rural communities, and could prevent Myanmar from heading down a predominantly fossil-fuel dependent course for it's energy future (Bringing Power to the People 1999).

ROADMAP

This paper will examine this emerging story from a variety of perspectives in an effort to understand the political economy in context.

It will begin with an in-depth comparison of centralized grid systems (CGS's) and decentralized energy systems (DES's), as they are the two main forces that must be reconciled in the transition to a cleaner, low-carbon energy paradigm. In particular, it will look at how the history and economics of CGS's led to its widespread implementation, but how the pressures of climate change mitigation are calling the viability of these systems into question (Flavin & Lenssen 2010). From there, the paper will explore DES's as an attractive alternative, looking at their potential benefits in light of scholarly recommendations for necessary projected changes in energy system structures. Finally, this section will conclude with the introduction of the Smart Grid concept, which can be understood as a way of networking DES's so that they can be more readily integrated into a CGS, allowing for a two-way flow of energy and the maximization of both resources and finances, as well as increased control of energy efficiency and usage at the community level (Fox-Penner 2010).

Once the two main energy system structures in question (CGS and DES) have been defined and investigated, the paper will then turn to an analysis of how top-down vs. bottom-up development strategies have played a role in the development of these structures. In this way one may begin to understand how the actors engaged in these development strategies operate, as well as how their particular interests may be

hindering or helping the transition to an economically feasible, low-carbon energy paradigm.

As the paper begins to move into the case study of Myanmar, it is here that the concept of a "mesolevel" development strategy will be introduced, as it incorporates the resources and expertise of the top-down approach with the local knowledge bases and socially conscious ideals of the bottom-up approach (Reid et al. 2010). This mesolevel development strategy is situated to create a development climate that will help Myanmar transition towards a Smart Grid system.

The study of Myanmar will require an understanding of Myanmar's recent history, as it is still very much an important factor in the present day political happenings within the country. The paper will then dive into an analysis of the NLD's stated core strategies and development ethics, with the goal of understanding how the NEP might be challenged as the NLD takes over full control of government operations. It will then look at how the NEP embodies certain ideologies inherent in the top-down approach, and attempt to identify ways that this may be limiting bottom-up energy development approaches. This will be done by drawing upon qualitative interviews conducted during this author's visit to the country in March 2016, as well as an in-depth review of the implementation strategies currently in place, at both scales of development. The case study will include proposed efforts to restructure the NEP's fundamental approach and introduce regulatory frameworks, needed policies that could support the development of a flourishing private micro-renewable sector, and

recommendations for how the country can move towards a Smart Grid-based, low-carbon energy future that integrates both top-down and bottom-up approaches into a mesolevel strategy.

Finally, the paper will attempt to apply the lessons of Myanmar's electrification efforts to the broader context of Sustainable Development. It will make recommendations for infrastructure planning procedures, with an emphasis on cross-sector participation, increased community ownership of energy resources through the formation of ICES's, and the application of the mesolevel development approach.

SECTION 1: ENERGY DEVELOPMENT: TRADITIONAL STRATEGIES VS. NEW* APPROACHES

While the underlying theme of this paper is concerned with how different development approaches lead to differing outcomes in the context of energy development, this conversation cannot begin without an understanding of energy generation structures. This section will provide a basic overview of these structures, so that the discussion of development approaches in Section 2 may be viewed with an understanding of how these structures came to be, as well as the different needs that they service. Initially, Section 1 will outline the history of national utilities and grid systems in order to understand the logic behind their continued use by national governments. However, it will then explore how the need for a coordinated international response to climate change and surging populations may be affecting the viability of these systems. It will then turn to an examination of the use of integrated

community energy systems, backed by micro-renewables, as a potential building block for a new electrification blueprint.

1.1 CENTRALIZED GRID SYSTEMS: ADVANTAGES AND DISADVANTAGES

At the end of the 19th century and into the beginning of the 20th century, much of what we now call the developed world went through a rapid and truly remarkable transformation thanks to the advent of the light bulb and transmittable electricity. As the technology advanced and became more widespread, mainly in Europe and the United States, the issue of power generation became one of critical importance. Innovations in the field of electricity were changing practically every facet of life in these countries, from manufacturing to education to public safety. Initially, generation occurred within municipalities, with factories or major industry buildings creating their own electricity in basements or nearby power plants. However, Samuel Insull, a member of Thomas Edison's personal staff, realized that it would be cheaper to distribute electricity when consumption was aggregated via a massive web of interconnections, which we now commonly refer to as the grid. By harnessing economies of scale in electricity production, Insull, as CEO of one of the earliest utility holding companies Commonwealth Edison, was able to combine small power systems all over the United States and ultimately turn a scattered infrastructure into one dominated by large centralized utility companies (Fox-Penner 2010, 1-3). This system was essential to the initial stages of widespread electrification and has been adopted all over the world as the standard model of national energy infrastructure.

Due to the centralized nature of national grids, they often require the backing of large-scale power plants to meet the massive demand of whole populations. For decades, this has been possible via huge turbines that rely on the burning of fossil fuels, chief amongst these being coal - this is still the main method of electricity generation today. While national grids managed by large utility companies represent the most cost-effective model, this is primarily due to the widespread employment of government subsidies and the cheap cost of fossil fuels (Flavin & Lenssen, 1994). However, as climate change has become a widely accepted reality around the world, the economics of national grids may begin to change. The transition away from fossil fuels is already presenting major challenges for these systems that are so inherently dependent on cheap, dirty sources of energy. As more and more countries commit to carbon reduction policies, the true cost of overhauling these massive grid systems grows in tandem, and it is very clear that it will not be an easy or inexpensive process.

As an initial step in this process, many utility companies are looking to increased energy efficiency as a way to conform to new climate policies. Unfortunately, the modern power industry, as devised by Insull, was designed to produce and distribute as much electricity as cheaply as possible, which runs counter to the concept of efficiency in many fundamental ways. This means that centralized energy systems as we know them will have to change their structure dramatically in the coming decades if they are going to adopt new supply sources and increase efficiency, all the while continuing to increase transmission rates as populations and the demand for energy continue to grow at an historic pace (Fox-Penner 2010).

While centralized grid systems have worked well to supply electricity at low cost to billions of people, the fact remains that over a billion people still live their daily lives without consistent (or any) access to this critical resource. The majority of this population lives in hard to reach remote areas, and/or lives in a country that has struggled to coordinate its political resources in a way that promotes the continued extension of a reliable grid system (International Energy Agency 2015). The UN's Sustainable Energy For All (SE4ALL) program calling for 100% global electrification by 2030 is ambitious, although it may be a bit optimistic in its encouragement of grid expansion to service these populations. In many cases the costs of building transmission lines to remote areas can be extremely high, as are the costs of building large-scale power plants that are able to produce adequate energy for huge populations (Glemarec 2010). At the same time, grid extension can come at a huge environmental cost, often in the form of clear cutting trees to make room for transmission lines, flooding of substantial land areas as a result of massive hydropower developments, and the release of greenhouse gas emissions from the burning of fossil fuels at large power plants (Flavin & Lenssen 1994). While centralized grids may have been an appropriate solution for the initial stages of widespread electrification, it does not seem like a strategy that will meet the goals of emissions reduction and sustainable development generally. As such, a revised energy system is needed in many areas to account for these factors.

1.2 DECENTRALIZED ENERGY SYSTEMS

If one is to recall the very beginnings of municipal electrification, before the concept of centralized grids became widespread, energy generation was a local

endeavor largely undertaken by private producers. However, due to the massive space requirements of energy generation at the time, centralized grids were a better solution in that they could make better use of both space and resources, as well as electrify larger areas.

Interestingly enough, it seems like the energy systems of the future may be headed back to a similar, decentralized format (Fox-Penner 2010). As RE technologies have become both cheaper and easier to install and maintain, small-scale projects have in turn become a much more viable solution, especially for remote rural communities in developing countries that have yet to experience the benefits of grid connectivity (Koirala et al. 2015). These systems can come in many different forms depending on the resources and topography available to a certain community – as a result, they often take advantage of RE resources to generate power. For example, a more flat, arid region is far better suited to solar home systems, whereas a mountainous community could take advantage of micro-hydro resources, or even wind, to generate power. Unfortunately, if these distributed energy resources (DER) operate independently they are subject to issues of reliability, mainly as a result of a lack of storage options or consistent year-round conditions (Trainer 2010).

To account for these shortcomings, distributed (also commonly referred to as decentralized) energy systems (DES) have been proposed, and many are being tested around the world (Terrapon-Pfaff et al. 2014; Allen et al. 2012; Neves et al. 2014; Ranaboldo et al. 2014). These commonly exist in the form of community micro-grids,

which are small independent grids separate from the national grid that connect several small, distributed sources. The DES approach is being pointed to as the foundation of a viable option for the future of electricity generation because it accomplishes what Fox-Penner (2010) describes as the three main objectives for a new power industry model: 1) it creates a "decentralized control paradigm," meaning that consumers will have more control over their usage and access to pricing information, 2) it retools the system to take advantage of low-carbon or renewable supply sources and 3) it encourages business models that promote efficiency over mass production.

SECTION 2: DEVELOPMENT APPROACHES: TOP-DOWN, BOTTOM-UP AND HOW THEY RELATE TO ENERGY DEVELOPMENT

Now that the paper has broadly defined the structures that arise from opposite ends of the energy development spectrum, it will turn its attention to the spectrum of development approaches. The aim of this section is provide an understanding of how top-down and bottom-up approaches naturally arrive at these energy structures. With this knowledge in mind, we may then later begin to see how these approaches can and must be reconciled in order to settle on a structure that falls somewhere in the middle. This section will review literature and ideas surrounding top-down and bottom-up development and attempt to summarize the goals, advantages and disadvantages of each approach in the context of energy development.

2.1 THE TOP-DOWN APPROACH: EVALUATING THE ROLE OF IO'S IN THE IMPLEMENTATION OF NATIONAL DEVELOPMENT STRATEGIES

While multiple International Organizations (IOs) play critically important roles in energy infrastructure development efforts around the world, the World Bank (WB) plays the most prominent role, both generally and in the context of Myanmar. Thus, this section will begin with a brief history of the WB's genesis, as well as how it's stated goals and strategies have changed over the past few decades. Hopefully this will grant us a better understanding of the reasoning and implications behind the WB's current development strategies. As the WB in many ways represents the principal guiding force of the top-down paradigm, this paper views its agenda and strategies as representative of top-down development strategies in general.

2.1.1 THE RISE OF IO'S AND A NEW INTERNATIONAL, TOP-DOWN FOCUS ON DEVELOPMENT

With the formation of the United Nations in 1945, the international community suddenly found itself with an organizing framework through which coordinated intergovernmental efforts could attempt to tackle issues of global security, political stability and overall economic development. Through the use of Funds, Programmes and Specialized Agencies, the UN stated that it would seek to "promote higher standards of living, full employment, and conditions of economic and social progress and development (The United Nations 1945)." Most importantly, the UN format now allowed for developing countries to represent their interests and goals on a global stage, as well as (hopefully) play a role in the formation of policies that may affect how aid was

distributed or utilized. Although it was not the first attempt at a form of global governance (the League of Nations operated on similar platforms but was ultimately dissolved), the UN has been the most enduring and respected institution of its kind to date. While the UN is not directly involved in the issues under consideration in this paper, it does act as an ideological driver of development and is thus important to consider as a factor behind the strategies and beliefs of other IO's (Fues et al. 2007)

Around the same time that the UN was formed, the major Allied powers, alongside delegations from many developing countries, came together at the Mt. Washington Hotel in Bretton Woods, New Hampshire to develop "a new multilateral legal framework for financial relations (Helleiner 2014, 1)." The economic failures of the interwar period, along with the crippling devastation of WWII, left the world in dire need of a stable financial system that could help the world recover and avoid financial crises in the future. The resulting Articles of Agreement outlined a plan to establish fixed-but-adjustable currency exchange rates and limit international capital flows, in an attempt to help countries deal with fundamental disequilibriums (large payment imbalances resulting in damaging domestic adjustments), as well as help countries decimated by WWII to recover and rebuild.

Additionally, the delegates established two major IOs that continue to function in the present day: the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD), which this paper will refer to as the World Bank (WB), which is the name most commonly used today. While the duties of these

organizations varied slightly, their common goal was to stabilize currency markets and guide countries' efforts towards reconstruction, development and ultimately growth. The IMF was largely in charge of controlling a stabilization fund, a giant pool of gold and foreign currencies contributed by different countries used to manage balance of payments and liquidity crises. The World Bank, which is now known as the World Bank (WB), was responsible for mobilizing international development lending. Considering that this paper is mainly focused on energy infrastructure development, the World Bank is the most relevant IO in this context. The next few sections will attempt to outline the World Bank's agenda, as perceived by development scholars, as well as identify advantages and disadvantages of the top-down approach in development.

2.1.2. UNDERSTANDING THE TOP-DOWN APPROACH THROUGH THE WORLD BANK AGENDA

The World Bank officially states that its two over-arching goals are to end extreme poverty and boost shared prosperity. While these are admirable and necessary aspirations, they are attempting to address issues that are both massive in scale and incredibly complex, for a variety of reasons. At the same time, these goals are based on assumptions about wealth, inequality and the functions of economic development that may not be shared by all whom they intend to help. Nevertheless, the World Bank has been an integral aspect of international development work over the last several decades, and this author believes that its intentions are generally founded in the betterment of living conditions for all people. Any perspectives or opinions presented hereafter should be taken as critiques of its process and not of its intent.

Since its outset, the primary strategy of the World Bank's development process has been focused on specific project development. This is largely due to a desire, expressed initially at Bretton Woods, for capital to be invested for "productive" purposes (Baum & Tolbert 1985, 6). The project concept has been co-opted by most multilateral lenders and remains the primary strategy of large development institutions (Baum & Tolbert 1985, 9). The definition of a project is quite broad, and can range from multi-billion dollar investments in specific infrastructure projects to capacity building consulting for national governments to training programs for health and education professionals.

The project concept, with its emphasis on measured outcomes and careful planning, is to be expected from institutions attempting to tackle broad issues in the developing world with massive amounts of capital – the results can be hard to measure and the capital investments can be risky. However, there are those who believe that the World Bank and other large multilateral lenders inherently represent "global and anti-global forces that lead to outcomes greater than the sum of the interests of the participating states" and give the "illusion of mutual benefit to all partners (Stein 2008, 6)." This construction of institutionalized rules and goals has allowed for the increased acceptance of mainstream economic theory and development theory. The concern here is that these theories, which are heavily embedded within Western knowledge constructs, are now being applied in the pursuit of worldwide project development through the World Bank and other similar institutions. This is problematic in that the project concept may have a tendency to prioritize policies and reforms that do not

necessarily reflect the specific needs of the affected, but rather are designed to satisfy the goal of high return on investment and achieve broad advancements in economic development, outcomes defined and assessed by Western dominated institutions.

The project concept is understandable within the current structure, and is at least comprehensive in its desire to both design project-related policy and guide institutional reforms (Baum & Tolbert 1985, 10). However, it is the tendency for actors exercising a top-down model to enact policies derived from "a confluence of factors interacting with an array of existing structures and interests (Stein 2008, 5)" that should be considered within the context of this discussion. The World Bank, for several reasons, is indeed a necessary player when attempting large-scale development such as an energy infrastructure – however, one should understand that it can be difficult to separate its embedded ideologies from its proposed solutions.

2.1.3. THE WORLD BANK AND ENERGY POLICY – TOP-DOWN DEVELOPMENT IN CONTEXT

When considering this assertion in the context of energy development, the rationale behind the World Bank's approach in this sector becomes easier to understand. Large-scale energy infrastructure projects require careful planning that takes into account lengthy gestation periods and sometimes limited available resources. Due to the World Bank's project model, which relies on judiciously (and often conservatively) selected outcomes, there is the tendency to prescribe solutions based on the current state of technologies and economics so as to increase the project's chance of successfully reaching said outcomes. While this approach may be better

engineered to produce results, it does not necessarily inspire the pursuit of outcomes that could require investment in new technologies or structures beyond the status quo. As mentioned earlier, the transition to a Smart Grid system will require a fundamental restructuring of the energy infrastructure status quo, one that requires participation from both ends of the development paradigm. In many ways, the top-down approach may be better understood as a center-down-and-out approach, as it focuses mainly on the centralization and maximization of resources and processes (Hansen, 1981). With this in mind, one can see how CGS's are largely favored by the World Bank and top-down development actors when planning national energy infrastructures, as they are essentially the physical embodiment of this approach. Although DER's are increasingly being considered within this model, the fact remains that the centralized grid structure is the predominant aim within this framework.

Planning a large energy infrastructure also requires significant pre-investment research into many different areas: cost-benefit analyses, power demand forecasting, subsector balancing, technical assistance and governmental capacity, etc. The World Bank does it's best to engage with all of these concepts, although the amount of forecasting required can be time-consuming and result in delayed decision-making. When time-constrained goals are introduced, such as the UN's SE4ALL initiative, this makes it increasingly difficult for top-down actors to balance careful research and planning with efficient implementation. This further explains the tendency for top-down actors to pursue business as usual strategies (i.e. CGS's) and avoid proposed structural or technological changes when investing in energy infrastructure projects.

2.2 THE BOTTOM-UP APPROACH: ATTEMPTING DEVELOPMENT WITHOUT INSTITUTIONAL STRUCTURE

As shown in Section 2.1, the development of the Global South since the end of WWII has been largely dominated by organizations and discourses that were borne out of the interests and ideologies of the Global North. The neoliberal approach to development theory in the last few decades of the 20th century made the reliance on these top-down structures especially damning, as market liberalization polices had disastrous consequences for development efforts in many parts of the world.

However, the recent transition away from the Washington Consensus model, which emphasized neoliberalism and privatization of markets over all else, has led to new ways of thinking about development worldwide, not just in the Global South. There is an increasing desire to break away from the broad and often inappropriate prescriptions of top-down international development policy in favor of processes that arise organically from domestic contexts, allowing for the unique political economy of each country to develop its own solutions. As a result of this change in thought, bottom-up development strategies have come into scholarly focus as a way to address needs as they are experienced empirically, not as they are perceived institutionally.

2.2.1 CONSIDERING THE BOTTOM-UP APPROACH

It is difficult to define the bottom-up approach in the same vein as the top-down approach. Both paradigms are conceptual constructs, although the institutional nature of the top-down approach allows for it to be viewed more as a coherent systematic

framework supported by mainstream economics. The bottom-up paradigm is more difficult to structure, perhaps because it "would need to be supported by a variety of disciplines … and the cumulative co-operation between different disciplines is apparently very difficult to achieve (Stohr 1981, 40)." Considering this, it may be easier to understand the bottom-up paradigm *in contrast* to the top-down approach, as Stohr (1981) has done in his work *Development from Below*: *The Bottom-Up and Periphery Inward Development Paradigm**. Stohr explains how the bottom-up paradigm "implies alternative criteria (39)" for factor allocation, commodity exchange, and specific forms of social and economic organization. He goes on to describe how embracing this approach would require a fundamental change in the way we consider development:

> …going from the present monolithic concept defined by economic criteria, competitive behavior, external motivation, and large-scale redistributive mechanisms to diversified concepts defined by broader societal goals, by collaborative behavior and by endogenous motivation.

Stohr emphasizes how a bottom-up development approach would have to fundamentally differ from the top-down approach in that "no uniform patent recipe for [development] strategies can be offered (64)." Instead, an understanding of socio-cultural, historical and institutional conditions must be considered when mobilizing resources at this scale.

This transition in development thinking has been more succinctly summarized by Stevens & Morris (2001), as they state, "the economy should serve people, as opposed to people serving the economy (151)." The key debate behind this idea is nationalism vs.

regionalism, at a fundamental level, as well as the subsequent concept of a coordinated national economy. While developed countries were largely able to define their borders on their own due to their colonial might in the 19th century, many developing countries today had their borders drawn for them as the same colonial powers exited. This practice often grouped regional civilizations under a national umbrella, with the expected goal of devising a centralized economy based on the maximization and efficiency goals of the top-down paradigm. Whereas before these communities and/or civilizations developed independently and achieved fairly similar levels of material development (Abdalla 1978, 19), attempts at "insufficiently prepared large-scale economic integration (Stohr 1981, 44)" have produced severe regional disparities and led to dysfunctional national economies. While the concept of nationalism is not going away anytime soon, even with the advance of globalization, an emphasis on regional endogenous development goals could produce far more equitable outcomes.

2.2.2. DECENTRALIZING THE BOTTOM-UP APPROACH

In order to bring the focus back to the main topic of this paper, energy infrastructure development, it is time to look at how a bottom-up approach, as I have broadly defined it, has resulted in specific types of energy systems. Due to the incessant centralizing forces of top-down development structures, true regional, bottom-up development largely occurs in areas where national infrastructures or systems have yet to fully take hold, if at all. In this often-remote context, the approach is generally aimed at "minimizing waste of scarce, and maximizing use of regionally abundant, resources

(Stohr 1981, 65). In order to fulfill their energy needs, these communities (if they have access to relevant technology and materials) often devise their own electricity generation systems outside of the national grid (i.e. a DER). However, as mentioned earlier, DER's at this point in time usually lack the capacity to generate reliable energy, either due to insufficient storage options or the intermittent availability of both renewable sources, such as flowing water for example, and fossil-fuel based sources, such as diesel fuel.

Recent innovations in micro-grid technology have allowed for the more effective coordination of DER's, granting a collection of individual houses or communities with generating capabilities the ability to pool their resources and control the flow of electricity to improve reliability. However, as will be shown in the context of Myanmar, developing countries that have been exploring this concept are usually also in the process of expanding their national grid. This can have negative implications for investment in micro-grids, for reasons to be explored later. In order for the goals of bottom-up development to be realized, a middle ground must be achieved.

SECTION 3: EXPLORING THE CONCEPT OF MESOLEVEL DEVELOPMENT IN THE CONTEXT OF MYANMAR'S ELECTRIFICATION EFFORTS

Reconciling the advantages and disadvantages of top-down and bottom-up development approaches is a formidable task indeed, as this paper has now explored

the fundamental contradictory nature of their respective theoretical frameworks. However, if the world is committed to achieving a low-carbon future that is both sustainable and equitable, this reconciliation process must be undertaken carefully, and in earnest. This section will attempt to explore this process in the context of the upcoming electrification efforts in Myanmar, in an effort to synthesize and contextualize the concepts this paper has explored thus far.

This section will attempt to cover multiple concepts through this situated context. First, it will provide a compressed history of Myanmar, so that one may see how Myanmar's recent political history has contributed to the current development climate. Next, it will introduce the concept of mesolevel development, as it has been described and understood in development literature, as well as attempt to explain why electrification efforts in Myanmar offer an ideal context in which to view this development approach. From there, it will look at how the top-down approach, represented by the World Bank, other multilateral lenders and the most recent iteration of Myanmar's national government, has led to a proposed centralized energy development strategy. It will then describe the role, both historic and current, of micro-renewable DER's in non-urban areas of the country. Once the interplay between these top-down and bottom-up strategies has been clarified, the discussion will move towards current efforts to envision a more balanced approach to electrification, one that could better integrate Myanmar's current centralized grid with its established DERs. Finally, it will attempt to propose how development actors of all scales may better fit into this mesolevel approach, as well as identify key legal and regulatory policies that will be

necessary in achieving a mesolevel framework and initiating the transition to a Smart Grid system.

In this section, I will be transitioning into the use of the personal "I," as it will be easier to relate my findings from a trip I took to the country in March of 2016. While I was in Myanmar I conducted qualitative interviews with several different actors in the energy development world, in an effort to understand how top-down and bottom-up development approaches are currently affecting Myanmar's electrification efforts, as well as to investigate whether or not a mesolevel solution was being considered or pursued.

3.1 PLACING MYANMAR'S DEVELOPMENT IN A HISTORICAL CONTEXT[2]

In order to truly grasp the complex political economic situation surrounding current energy development efforts in Myanmar, it is necessary to understand the political turmoil from which it is currently emerging. Myanmar's history constitutes centuries of glorious empire, countless wars, British colonial rule, and finally an incredibly tumultuous post-colonial era of political upheaval. While aspects of this history may seem unrelated to the topic at hand, this author has found that nearly every aspect of Myanmar's past plays a compelling role in forming the current development climate. A basic understanding of Myanmar's history will also serve as an introduction to

[2] All information within this section was condensed from the Encyclopedia Brittanica, in an effort to provide an unbiased perspective.

the country in general, as much of the discussion about the current state of the country is grounded in its past. From the influence of ancient and colonial tourism to the lingering distrust of politicians, the history of this country continues to influence development in often confounding and frustrating ways, as well as influence new strategies and solutions.

3.1.1 ANCIENT CIVILIZATIONS, COLONIAL STRUGGLES AND THE INDEPENDENCE PROCESS

Located in the heart of South Asia, Myanmar shares a border with a diverse range of countries: India, Bangladesh, China, Laos and Thailand. While these countries vary in their pace of economic development, Myanmar lags, in many ways, significantly behind the region and the rest of the world in this category. This can be mainly attributed to a difficult and violent 20th century, which saw the country struggle to transition from colonial rule to independence in the span of a few decades.

Myanmar has been inhabited by humans for nearly 11,000 years and has a history of different kingdoms and regimes dating back to the 1st century BCE. For centuries it was an integral part of the trade route between China and India, and later became the western gateway to mainland Southeast Asia. During this period it developed a reputation as an incredibly prosperous and devout region (Thousands of Buddhist structures still exist throughout the country, and are a main driver behind the country's recent tourism renaissance). For several centuries leading up to British colonial takeover in 1885, Myanmar experienced a cyclical pattern of unification and

rebellion that ultimately resulted in the majority rule of the Burmese people and a multitude of different ethnic groups vying for representation throughout the country.

Unfortunately, in an effort to extend its colonial coastline in South Asia from India all the way to Singapore, the British completed their military takeover of Myanmar in 1885. The British renamed the country Burma, and quickly set about dismantling both the monarchy and the monkhood, two critical pillars of Burmese society. While the British were quite effective in their efforts to develop a transportation infrastructure and build up a massive export-based economy centered on rice, the Burmese people were rarely the beneficiaries of these policies. In the years leading up to World War II, the British, backed by Indian forces, would encounter several different rebellions from peasants and organized rebel groups alike. WWII would see the invasion of the Japanese, with whom Burmese rebel leaders formed a brief alliance. By the end of the war, the Burmese National Army had been established and the Burmese and British were allies once more. The years after World War II were particularly tumultuous, as the revolutionary leader Aung San and most of his cabinet members were assassinated by conservative enemies. In their place, a conservative regime was established and Myanmar achieved full sovereign independence in 1948.

3.1.2 POST-INDEPENDENCE STRUGGLES AND THE RISE OF AN OPPRESSIVE MILITARY REGIME

Peace would not last long, however, as a military coup de etat in 1962 halted the new union government's attempts at economic recovery. The military would ultimately embark on a decade long commitment to a socialist "command economy," stagnating economic growth due to its overzealous interest in industrial development. The formation of a new government structure and constitution in 1974 breathed some life back into the Burmese economy (although all executive members still had direct connections to the military), however the eighties would see a severe slowdown largely due to falling commodity prices, as well as an increase in import prices and external debt payments. The regressive policies of the government would culminate in a 1988 revolt, which saw a violent crackdown on unarmed civilian protestors and resulted in thousands of deaths. This dark period in Burmese history brought on a new military coup, martial law, the replacement of the constitutional government with a military council and widespread international condemnation.

It was at this point, in 1990, that the National League of Democracy (NLD), a coalition that had been formed in opposition to the government, arrived on the political scene . The military called for the first multi-party elections in nearly three decades, which saw the government backed National Unity Party (NUP) pitted against the NLD, led by Aung San Suu Kyi, daughter of legendary independence figure Aung San (It is important to note that Suu Kyi was under house arrest at this point). While the NLD won a landslide victory, winning nearly four fifths of the seats in the Hluttaw (parliament), the military government refused to acknowledge the results or let the newly-elected government convene, and kept most of the NLD's leaders under house arrest. The

regime's heavy-handed role in overriding this attempt at democracy sparked additional international condemnation.

The military regime cemented its control over the country in the 1990s, launching a broad takeover of the economy through the formation of two conglomerates aimed at controlling domestic businesses and joint ventures with foreign firms. In response to reports of widespread human rights violations, the US and the EU levied economic sanctions against the country, which put additional stress on an already struggling economy. Reacting to these sanctions, the military government began initiating new attempts at democratization. After the turn of the century, the country experienced another decade of failed constitutional reforms and leadership changes. Adding to its development woes, tropical cyclone Nargis decimated the highly-populated southern regions of the country. Nargis claimed nearly 138,000 lives and severely damaged the infrastructure of the region, as well as interrupted an attempted constitutional referendum process. The military government's poor response to the disaster, evidenced by it's unwillingness to accept foreign aid money or disaster assistance workers, further exacerbated the effects of Nargis and was harshly criticized by the international community.

3.1.3 THE END OF ISOLATIONISM AND THE TRANSITION TO A MODERN DEMOCRACY

In a promising move towards democratization, the first general election in nearly 20 years was held in 2010. Military officials in the two main government parties, the

NUP and USDP, rescinded their military status in order to run as civilian officials and managed to field a candidate in nearly every race for national legislature and local assembly seats. The opposition parties at this point were highly fractured and therefore could not compete in most races, leading to an overwhelming victory for the NUP and USDP candidates. Unfortunately, there were widespread claims of election fraud and the election was largely viewed as an illegitimate move by the military to legitimatize its power over the country.

Despite the contentious election in 2010, the ensuing government, led by former general Thein Sein, embarked on further reforms to help bring the country out of political and economic isolation. The NLD was allowed to formally register as a party in 2012, and won 43 of the 45 available seats in that year's parliamentary by-elections. This move was hailed by the international community as a significant step towards legitimate democratic reform, and prompted the lifting of several economic sanctions that had been crippling Myanmar's economy. Additionally, Myanmar's national currency, the kyat, was allowed to float on international currency markets, which brought a much-needed measure of stabilization. As a result, both tourists and foreign investment capital began to trickle into the country, initiating a few years of solid economic growth and the initial steps towards lifting the culture of oppression that had permeated the country for decades. However, Thein Sein's administration did very little to reform the antiquated government structure that favored the military or to crack down on the widespread practice of crony capitalism that had stagnated development efforts for decades.

In November of 2015, Myanmar held what would amount to its first freely contested general election. The NLD, led by the now liberated and wildly popular Aung San Suu Kyi, had been building political momentum throughout the country and managed to win a vast majority of the seats in both sections of the national government. Although the constitution mandated that the military retain one fourth of the parliamentary seats, the NLD now found itself as the majority party with effectively total control over the government. The NLD's victory was met with widespread celebrations throughout the country, as the Burmese people had been yearning for a fair democracy for decades and were in nearly full support of the NLD. Oppressive national media laws were liberalized and foreign investments in multiple sectors of the economy, such as telecommunications, began pouring into the country at unprecedented rates. The NLD took over full control of the government of Myanmar (GOM) on April 1, 2016 and elected Htin Kyaw, a longtime friend and political ally of Aung San Suu Kyi to the presidency. Suu Kyi was barred from the presidency by a constitutional provision that had been passed in years past for exactly this reason, although she appointed herself to the newly-created position of State Counselor. In the weeks leading up to April 1st she had declare that she would assume a position higher than the presidency.

3.1.4 THE STATE OF MYANMAR TODAY AND ITS BROAD DEVELOPMENT NEEDS

Now that the paper has established a general understanding of Myanmar's tumultuous past, it is important to examine how it has affected the current state of

affairs in Myanmar today. The decades of military or quasi-military rule that begin in the 1960's were devastating to Myanmar's development generally, from the infrastructure of its transportation, finance, and energy networks to its social programs. As a result, Myanmar is significantly behind the rest of the world and the region in the development of these areas. In a less tangible sense, these decades instilled in many a deep-rooted distrust of the political system, which is a far more difficult problem to address.

I visited Myanmar from March 19 – 28th, which were some of the final days before the NLD took over official control of the government on April 1st. Many conversations that I had with Burmese citizens during my time in country reflected optimism towards this change, which has been publicly discussed since the November election results were confirmed **(S)**. However, as the reality of the transition was so near at hand, I also read and heard some concerns from both news sources and individuals about the new government. For example, some are skeptical about the political backgrounds (or lack thereof) of many of the NLD MP's. For most MPs, this appointment marks their first foray into formal politics, at a national scale no less. Many of these MPs don't come from official political backgrounds – many of them are poets, activists or unofficial community leaders **(find source to corroborate this)**. As such, there are doubts about their ability to step into such a high-pressure political role and navigate the rapidly changing bureaucratic structures of the government effectively. At the same time, some people are uncertain about the political ambitions of the new MPs. The concern is that the MPs coming from previously marginalized or underrepresented groups, especially the more rural, ethnic groups, will be less-inclined to focus on

development and unification of the country than the priorities of their own constituents.

While the uncertainty surrounding the backgrounds and ambitions of the new MPs is indeed an issue, the fact still remains that the political, economic and social goals of the NLD are, at this point, equally vague and unclear. Although it may be unfair to levy such an assessment on a yet-untested fledgling government, it still does not mean that the NLD's secrecy has not had its repercussions. At best, one can only glean an understanding of the NLD's goals via limited sources – the NLD's manifestos and official preliminary actions and announcements.

3.2 FINDING A MIDDLE-GROUND: DEFINING MESOLEVEL DEVELOPMENT

Now that the paper has established a general understanding of Myanmar's history and the resulting effects on its current state of development, it is now time to turn our attention back to the discussion of development approaches. Section 2 outlined the fundamental theoretical frameworks behind both the top-down and bottom-up paradigms, and identified the need for these approaches to be reconciled if more sustainable, equitable development outcomes are to be achieved, especially in the context of developing countries. I intentionally saved my discussion of this reconciliation process for this case study of Myanmar, for reasons that I will now clarify.

The term "mesolevel" is best understood as "a theoretical field where the structural mechanisms of the interactions between macro and micro levels can be

observed (Haanpaa 2005).” For the purposes of this discussion of development approaches, mesolevel development should be taken as an approach that seeks to mediate between the top-down (i.e. macro) and bottom-up (i.e. micro) development paradigms. It has already been established that, unlike the top-down approach to development, the bottom-up paradigm is far more difficult to define outside of a specific context, and the mesolevel approach is similar in that sense. I chose to analyze the top-down and bottom-up approaches in the same space because they represent the two farthest reaches of the development spectrum. The mesolevel approach, which can exist anywhere between the two ends of the spectrum, is arguably even more context specific than the bottom-up approach. It must coordinate both the effects and processes of the top-down approach’s institutional prescriptions with the unique sociocultural and regionally specific conditions that are considered in the bottom-up approach. Therefore, it seems most appropriate to introduce and explore the mesolevel via this situated context.

3.2.1 MYANMAR AS AN IDEAL LENS FOR ENVISIONING MESOLEVEL DEVELOPMENT

Energy infrastructure systems are nearly the perfect vehicle for examining mesolevel development, for in this context a mesolevel strategy would result in the physical connection of both top-down and bottom-up energy structures (i.e. CGS’s and DES’s) into an entirely new concept (the Smart Grid). Myanmar’s energy infrastructure is underdeveloped to the point where development can occur without the need to massively scale back existing structures, as would be necessary in a more developed

country. In this sense, it becomes easier to envision a mesolevel infrastructure system from the ground up, especially because the CGS and DES's have only just begun to come into contact with one another. At the same time, the influence of the top-down approach in Myanmar's electrification efforts is a confirmed reality. While the ideal energy future involves a much more widespread use of bottom-up energy structures, the truth is that this is far less likely without the financial resources and technical expertise of top-down institutions such as the WB. Therefore, a mesolevel approach is not only ideal, but entirely necessary.

The mesolevel approach, like the bottom-up approach, will vary from context to context according to differing political, social and economic realities. However, at the very least one can assume that a Smart Grid implemented and managed by a central government would require communication across multiple different sectors: upper-level government energy ministries or bureaus, state and regional governments, the private sector of large-scale power producers, both international and domestic non-governmental organizations (iNGO's & NGO's), multiple scales of the domestic and international finance sectors, community leaders, and finally, associations of small-scale power producers. This is by no means an insubstantial feat. Still, certain steps can be taken at both ends of the spectrum (i.e. the upper levels of government and the community level) to better facilitate this process. The examination of these approaches in the context of Myanmar will hopefully better elucidate the barriers to these necessary structural changes.

Thus, as the paper moves into a discussion of Myanmar's current energy landscape and its proposed goals for its energy future, one must keep the fundamental concept of the mesolevel in mind, especially as top-down and bottom-up approaches are explained in context.

3.3 DESIGNING AN ENERGY INFRASTRUCTURE IN THE 21ST CENTURY: THE ELECTRIFICATION OF MYANMAR

While Myanmar's overall national development efforts have a long way to go, a top priority of the incoming government is to dramatically increase electrification rates throughout the country. Current estimates show that less than thirty percent of Myanmar's population has consistent access to electricity, a truly shocking figure when viewed in the context of electrification rates in more developed parts of the world. According to this statistic, Myanmar provides the poorest level of energy access of any country in the Asia Pacific region (IEA 2012) Even in the predominantly urban areas that are serviced by the national grid, blackouts and brownouts are a common occurrence, as energy demand has nearly doubled in the past decade and new investments in energy infrastructure have failed to keep pace (Greacan 2014). In 2014, the government pledged to follow the guidelines of the UN's SE4ALL initiative and attempt to achieve 100% electrification by 2030 (Ross 2015). The following subsections will examine the top-down structures that are influencing efforts in this direction, as well as describe how existing bottom-up approaches may be affected by these proposed top-down strategies.

3.3.1 UNDERSTANDING THE NLD'S POSITION TOWARDS ENERGY DEVELOPMENT

As the NLD has now assumed control over the government of Myanmar, it is responsible for both devising its own policies and co-opting or revising the policies of the outgoing USDP wherever possible. Due to the fact that the NLD will be guiding policy approaches for the foreseeable future, an understanding of their position towards energy development is of critical importance as one begins to envision different pictures of Myanmar's energy future.

Beginning with the NLD's 2015 Election Manifesto, it is possible to extrapolate how the party's position towards specifically large hydropower development (mega-hydro) will change going forward. In 2012, Myanmar's energy mix was comprised of 71% hydropower, 27% natural gas and 2% coal (Ross 2015). The Manifesto (2015) acknowledges that "the construction of large dams required for the production of hydropower causes major environmental harm." It goes on to claim that the NLD will only utilize current mega-hydro resources, with a specific emphasis on increasing efficiency, indirectly stating they will not be pursuing the development of new mega-hydro projects (National League for Democracy 2015). This seems to be a direct response to recent protests directed towards several proposed mega-hydro projects in Kachin State, which constitutes the northernmost region of the country. Protestors have argued that these dams will displace numerous villages, result in severe impacts on the local ecological environment, and will not distribute electrification benefits evenly throughout the country (Herman 2015; Hennig et al.2012).

The Manifesto (2015) also acknowledges that "underground energy resources" (a diplomatic way of referring to fossil fuels) are harmful to the environment, and that while "easiest to exploit, they are finite, and it is therefore important to consider future generations when developing energy policy (19)." At the same time, they also pledge to "encourage the systematic development of small private energy production enterprises such as solar energy, biogas, rice-husk fuel, and mini-hydropower systems (19)." This is promising language, especially if Myanmar is serious about developing an energy system that effectively integrates these renewable resources, rather than a full-blown expansion of its national grid. However, as the paper will show in a moment, a combination of political and economic conditions within the country, as well as significant top-down influence from multilateral lenders and IOs, could severely hamper the NLD's ability to accomplish these goals.

3.3.2 INTRODUCING THE NATIONAL ELECTRIFICATION PLAN: EVIDENCE OF THE TOP-DOWN APPROACH'S LOVE OF CGS'S

In 2014, the government of Myanmar (then under the control of Thein Sein and the USDP) announced the beginning stages of a new National Electrification Plan (NEP) for the country. The NEP was formulated in direct conjunction with the World Bank and Columbia University's Sustainable Engineering Lab, as well as through consultations with the Asian Development Bank (ADB) and other major development entities. The overarching goal of the NEP is to achieve 100% electrification in all of Myanmar by 2030. Funded by a preliminary $400 million loan from the WB, the NEP, as it stands today, calls for that goal to be achieved through 98% CGS expansion, with the remaining few

percentage points reserved for DER projects, mostly in the form of micro-renewable systems (Castalia 2014). As shown earlier, CGS's in their most common form rely almost primarily on large-scale power plants for their generation sources. Considering that the NLD has announced a moratorium on mega-hydro development, which constitutes the vast majority of the country's energy mix, as well as acknowledged the environmental dangers of fossil fuel resources, there are many questions as to how the new government will approach this goal moving forward. Multiple agencies and organizations have recognized that Myanmar has significant potential for RE development, but barring vast advances in technology in the coming years it seems unlikely that renewables alone will be able to accomplish this goal.

3.3.3 ASSESSING THE PROPOSED ROLE OF SMALL-SCALE RE-BASED DES'S IN THE NEP: A TOP-DOWN APPROACH TO A BOTTOM-UP ENERGY STRUCTURE

The NEP has been proposed as a multi-stage process, and decentralized, RE-based micro-grid projects (i.e. DES's) are being pointed to as a short to medium-term solution to meeting the energy needs of rural areas that may have to wait several years for grid connectivity (Ross 2015). Of the 1 million households slated for electrification in the first phase of the NEP, 40% will receive non-CGS energy. The ADB, several UN agencies, and development organizations from several different developed countries have released reports outlining the potential for pilot projects aimed at developing DES's throughout Myanmar. However, through my interviews I learned that this top-

down approach to DES implementation is unrealistic and problematic for several reasons.

As I attempt to address these issues, I will be drawing heavily from my interview with David Allan, the founder of a Yangon-based NGO called Spectrum SDKN. The stated goal of Spectrum SDKN (Sustainable Development Knowledge Networks) is to support sustainable development efforts (as defined by "Our Common Future," Report of the Brundtland Commision 1987[3]) through the promotion of "transparency and accountability, while encouraging multi-stakeholder engagement between government, industry and civil society." Mr. Allan has previously spent much of his career in the private energy industry and has been in Myanmar since 2007 working to develop knowledge networks around participatory development approaches. He has been actively engaged in examining the NEP's policies as they relate to sustainable development, and he provided a wealth of knowledge that otherwise would not have been readily available to me.

Firstly, the NEP's projections for DES's are based on Least-Cost geospatial analyses, which have been derived by foreign groups such as the Columbia Earth Institute (Columbia University Earth Institute 2014). While these Least-Cost models are useful in terms of long-term planning, they are formulated entirely within the economic frameworks of existing CGS's. In fact, the economic planning for the NEP in general has

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[3] *Our Common Future* (1987) defines sustainable development as "development that meets the needs of current generations without compromising the ability of future generations to meet their own needs."

been predominantly based on existing grid structures – this leaves little room for structural alternatives and is not conducive to the proposed development of DES's. While the ADB, for example, claims that it is stepping back from coal-based power plant projects in Myanmar, the proposed financing projections do not reflect that as a reality – in fact, they suggest the opposite. This could explain why many development organizations were pushing to pass the NEP before the NLD (and it's policies concerning large-scale power generation) took control of the government at the beginning of April.

Additionally, the NEP refers to the implementation of DES's as a "pre-electrification" strategy. As one will see in the next subsection, this does not recognize small-scale developers and power producers who have been implementing RE-based DES's for decades. This language and fundamental institutional approach does not respect these developers for the passionate community organizers and engineers that they are. Uphoff and Esman (1974) describe how this fundamental hypothesis of the top-down development paradigm considers the population outside of the institutional development community as "incapable of initiatives in making improvements, consequently everything must be done for them . . ." At the same time, widespread grid expansion strategies assume that "the (socially and culturally) new and the (economically and politically) more powerful notions of development are also the 'better' ones (Stohr 1981, 41)." This is ideologically imperialist for a number of reasons, as well as additional evidence that the NEP has been formulated through a top-down development paradigm that overtly favors large industry and antiquated CGS models. However, given what has already been established about the WB's reluctance to invest

in projects that don't have readily achieved deliverables or outcomes, this should not come as a surprise.

3.3.4 RENEWABLE ENERGY INDUSTRY PERSPECTIVES ON TOP-DOWN DES IMPLEMENTATION STRATEGIES IN THE NEP

Renewable energy development in Myanmar up until now has been predominantly initiated by local developers and community leaders, "often with self-financing and limited technologies (Ross 2015, 13)". This is most likely due to the fact that the governance structure responsible for research and implementation is convoluted and non-conducive to the type of horizontal cooperation needed to support major renewable projects, or any major development project for that matter. Up until very recently, aspects of Myanmar's national energy infrastructure development were tasked to seven different ministries. In an effort to form a more unified approach, a strategy-focused National Energy Management Council (NEMC) was established, which featured a high-level official from each of these relevant ministries. Rather than work with the entire NEMC to develop the institutional capacity for more streamlined DES development as part of the NEP, the World Bank arbitrarily chose the Ministry of Electric Power (MOEP) and the Department of Rural Development (DRD) (a department within the Ministry of Livestock, Fisheries and Rural Development) to head up this part of the Plan. This decision was clearly made without appropriate research into the institutional capacity or roles of these Ministries (the MOEP is mainly concerned with grid expansion, while the DRD is primarily concerned with implementation, not capacity planning or technology research).

Patrick Pawletko is the Myanmar Fellow for Green Empowerment, a Portland, OR based iNGO that focuses on rural empowerment projects in developing countries. He has been working closely with the Renewable Energy Association of Myanmar (REAM), and he related to me in an interview that U Aung Myint, REAM chairman and national champion of renewable energy, has expressed his frustrations with the approach of these top-down prescriptions from development organizations and consultants. U Aung Myint believes that their actions do not respect the intricacies of Myanmar's political situation. As someone who has been involved in renewable energy work in Myanmar for over two decades, and has acted as the unofficial advisor to multiple energy ministries, U Aung Myint is disappointed that the World Bank did not contact him. To him, this reflects the WB's inability to engage with stakeholders who lie outside of the top-down development approach. The WB's prioritization of the MOEP and DRD has instigated infighting within the NEMC, further complicated the government of Myanmar's ability to handle the implementation of DES projects on its own terms, and patently ignored non-governmental groups that may have a far more nuanced perspective on the workings of the field.

3.3.5 THE BOTTOM-UP APPROACH TO DES IMPLEMENTATION IN MYANMAR: HISTORIC AND CURRENT TRENDS

During my trip to Myanmar, I was fortunate enough to visit with U Khun Kyaw, a micro-hydro developer in Taunggyi, the capital of Shan State in the east of Myanmar. The relevant top-down actors have identified Shan as a particularly conducive region for

micro-hydro projects, but this has been known to U Khun Kyaw and his colleagues for the better part of three decades. He has personally designed and coordinated the implementation of fourteen different micro-hydro projects since the 1980's, and is completely self-taught (which is incredible when one considers the amount of political upheaval that has occurred over this time span). The lack of a governance structure in place to facilitate RE implementation has severely limited his access to funding and resources, so the majority of these projects were donation-based and installed by volunteer laborers using rudimentary tools. Despite the lack of government support, U Khun Kyaw's projects have electrified several villages that are well beyond the reaches of the national grid, and as a result have drastically improved the quality of life for the people who live there.

U Khun Kyaw is certainly remarkable, but he is surprisingly not all that unique in Myanmar. Small-scale renewable-based DES's have been implemented in many forms throughout the country for decades, as a community-based response to basic energy needs in the absence of a coordinated national policy. Micro-hydro generators (see Figure 1) and rice-husk gassifiers are quite common in Shan State and the Irrawaddy Delta, respectively. As solar PV technologies have grown cheaper, the implementation of solar-home DES's in the arid central regions of Myanmar has become increasingly common. This is largely due to increased participation in rural electrification efforts by non-governmental entities. In two of my interviews, one with the Japanese International Cooperation Agency (JICA) and the other with representatives from Myanmar's largest

private energy company[4], I was informed that solar PV-based DES's were being planned in multiple parts of the country, and both groups emphasized this technology's increasing viability as an affordable electrification option. Unfortunately, these two actors also view these DES projects as short-term solutions, for reasons this paper will now explore.

3.3.6 BARRIERS TO INCREASED IMPLEMENTATION OF DES'S: COMPETING, RATHER THAN COMPLIMENTARY, APPROACHES

The NEP's overwhelming emphasis on grid expansion is threatening to render decades of hard work and RE innovation obsolete. Myanmar's national grid is heavily subsidized by the national government – urban dwellers pay virtually nothing for their electricity (and as a result have developed highly inefficient usage practices.) Due to the lack of any sort of coordinated Feed-In-Tariff system, which would grant guaranteed cost-based compensation to RE developers, these small-scale projects will not be able to sell their electricity at competitive prices.

Additionally, a general lack of legal and regulatory frameworks has been cited as significantly hampering the efforts of small-scale DES developers. Greacan (2014) outlines some of the main grievances to this effect that he encountered in his interviews with small-scale producers (SSPs), which I have listed below. The items marked with

[4] Due to the slightly informal nature of my research, I lacked the proper paperwork to quote this company by name. I was very fortunate to be able to interview members of their operational staff, as normally this right is reserved for professional reporters or other business officials.

asterisks indicate grievances that were related to me personally by U Khun Kyaw during our two days spent together:

- There are no standardized power purchase agreements for projects electing to sell to the national grid and tariffs must be negotiated on a time-consuming and inconsistent case-by-case basis. *
- There are no standardized rules across states and districts. *
- For projects in remote areas that serve retail customers, there are no provisions to account for what happens to a mini-grid and its customers when the national grid expands into the mini-grids area. *
- There are no provisional licenses or other agreements which developers can use to secure a site while the project progresses towards financial close and initiation of construction.
- Ironically, one developer was told by a state-level Chief Minister not to seek approval until after the electricity law is passed – even though the electricity law does not contain specific guidance for SPP approval.

To summarize, there exists a lack of coordinated regulatory and legal frameworks to guide the implementation of DES's. The introduction of these frameworks could greatly increase the ability for DES developers to attract investment and initiate more projects. This can largely be attributed to inefficient vertical and horizontal integration of policy goals or strategies within the national and regional governments, an inconvenient and all-too-common remnant of the bloated bureaucracy that the USDP has left for the NLD.

Section 3 thus far has presented a range of information to help us better understand the forces and actors that are affecting Myanmar's energy infrastructure development efforts. To briefly review, it began with a condensed history of the country to help us frame the development goals as they stand today. It then moved into a discussion of mesolevel development and introduced this concept in the context of

Myanmar's energy needs and aspirations. From there, it looked at the NEP as an example of the top-down approach in action, as well as examined how the bottom-up approach had fostered the creation of DES's throughout the country. However, it then highlighted how recent policy failures have prevented further development of DES's. The paper also explored how DES's are now facing the threat of obsolescence due to a combination of the WB-banked NEP's aggressive calls for CGS expansion and the lack of a coordinated plan for integrating DES's into the CGS. Now that one should have a clearer picture of how the top-down and bottom-up approaches are interacting in the context of the NEP, one can begin to look at methods that have been proposed that seek to reconcile these top-down and bottom-up forces.

3.4 TOWARDS A MESOLEVEL APPROACH: CURRENT ACTIONS AND PROPOSALS IN THE CONTEXT OF MYANMAR'S NEP

In looking at how the NEP has shaped energy infrastructure development thinking in Myanmar, this paper has identified several areas where the failure to reconcile top-down and bottom-up approaches could spell trouble for the future of RE-based DES's in the country (if they are not remedied soon): 1) Economic forecasting has relied on CGS models, leaving little room for the consideration of alternative structures; 2) Poorly structured systems of vertical and horizontal governance, exacerbated by top-down oversimplifications and uninformed policy prescriptions, have limited the availability of domestic resources for DES developers; 3) The lack of standardized frameworks for DES projects provides little incentive for private investment in the sector and provides no clear path towards the eventual integration with the CGS.

Fortunately, there are coordinated efforts underway to address these issues and move the country's development approach towards a model that better utilizes the resources of top-down development entities and acknowledges the validity of bottom-up systems, especially as they relate to environmental concerns and rural autonomy. If the NLD is serious about pursuing widespread RE-based DES development it must consider these mesolevel efforts, despite the pressures of the WB and multilateral lenders to implement a business-as-usual model that relies on a FF or large hydro-based CGS. In order to more critically examine these mesolevel efforts, I will address them one at a time in the following subsections.

3.4.1 THE POWER SECTOR VISION: A REAPPRAISAL OF THE NEP'S COST PROJECTIONS

As explained in section 3.3.3, the NEP's cost forecasts were based on least-cost geospatial analyses formulated by the CEI, as directed by the World Bank. In my interviews, Patrick and David independently criticized this approach, which I found quite interesting – clearly this is a significant point of contention. David's main criticisms, which I have already briefly outlined, center on the biased concept of using existing CGS economics as a base model. When these economic frameworks are extrapolated to a nationwide grid expansion model, the high costs of energy transmission and scheduled power-plant maintenance leave little room for alternative systems in the budget. However, by changing the model to one based on the economics of a Smart Grid, for example, drastically different results emerge, as transmission lines could be organized in a far more efficient manner and maintenance of DES's would require less labor and

capital overall.

Patrick's main issue with the CEI's Least-Cost Analysis is that the public can't assess the potential viability or validity of their model, as CEI has not released any final data records or flow rates to the public (Columbia University Earth Institute 2014). As such, the public is expected to take the economists at CEI at their word, despite the fact that there are potentially billions of dollars of public funds on the line. Patrick also believes that the CEI was wrong to exclude biomass potential from their model, as this can and should be readily assessed and factored in. Ultimately, he believes that the CEI and WB were wrong not to consult with REAM, as they are the primary source of RE knowledge in Myanmar and could have potentially influenced their strategies to be more comprehensive and inclusive.

Luckily, the World Wildlife Fund's Myanmar division is working on a new model for national electrification, which was explained to me in an interview with the project coordinator, Shoon So Oo over lunch in Yangon, Myanmar's business capital and cultural hub. The name of this new model is the Power Sector Vision (PSV), and its goal is to help the NLD-led government envision an alternative to the NEP. While the NEP is predominantly an action plan based on the interests of CGS's and the FF's that power them, the PSV presents a completely opposite approach, one that is based entirely in renewable energy.

Through careful and methodical scientific modeling, executed with the help of Australian firm Intelligent Energy Systems, the WWF has shown that Myanmar could achieve a power system powered by 100% renewable energy sources by 2050. The

planning of the PSV has been intentionally centered on cross-sector consultation workshops – representatives from multilateral lending agencies, the private energy sector, NGOs, Civil Society Organizations, development organizations and development experts have all been in attendance, as have representatives from Spectrum SDKN and REAM (WWF 2015). Once it is complete in early May 2016, it will be presented to the business sector in Yangon, the government sector in the capital, Naypyidaw, and to Civil Society and regional government leaders in the southern city of Dawei. The PSV embraces the concept of a diverse network of RE-based DES's, designed to maximize the high RE potential of Myanmar's landscape. It takes into account falling cost projections of RE technologies, as well as slowly transitions existing FF-based energy infrastructures out of the system. It is an amazing work of patience, collaboration and inclusivity, and addresses nearly every concern that David and Patrick raised about the NEP's projections. The PSV is a true embodiment of a mesolevel development approach, in that it makes efficient use of the World Bank's resources while promoting a bottom-up energy structure that increase rural autonomy and achieves significant environmental goals.

3.4.2 SHPAM: SCALING THE BOTTOM-UP APPROACH TO MORE READILY ENGAGE WITH THE TOP

In describing his experiences in dealing with the former government's renewable energy implementation structure, U Khun Kyaw identified many key areas where this governance structure had made his efforts to develop micro-hydro projects exceedingly difficult. He pointed to ways in which the vertical structure between the national and

regional levels of government, as well as the horizontal structure at the national ministry level combined to create a poorly organized and highly dysfunctional system. Considering the fact that U Khun Kyaw is a highly experienced practitioner of his particular brand of development craft, it seems like a waste of human capital for his efforts not to be supported by more efficient government structures. In order to best exemplify the level of dysfunction in the implementation of RE-based DES's at both the horizontal and vertical levels, I will share two stories that he told me over instant coffee and biscuits in the sitting room of his beautiful home in Taunggyi.

The first story is about his experience with a rather inefficient and inadequate regional energy minister. U Khun Kyaw approached him looking for a price estimate for a set of transmission lines that he needed installed in order to finalize his most recent project. The minister referred him to a government-controlled corporation that had could offer him the relevant services – this corporation quoted him nearly double what he expected to pay. As he unfortunately had a wealth of similar past experiences from which to draw from, U Khun Kyaw knew that the minister was most likely receiving kickbacks from this company. When he asked the minister for a second opinion, the minister refused and told him that he would have to figure out an alternative. As a result, U Khun Kyaw had to call on the small network of foreign benefactors that he had built up throughout his career to try to scrounge up the additional funds (most of which he knew would probably end up in the pockets of the minister). Later that year, in the open election that would see the NLD take control over parliament, the minister received 5 out of a total of 10,000 votes. He had been appointed by the USDP years

earlier and truly knew nothing about energy development – his reign of crony capitalism had come to an end.

From this experience, U Khun Kyaw realized that his powers as an individual were limited and that the time had come to collaborate with other developers. His solution was to form the Small Hydropower Association of Myanmar (SHPAM). Their website, shpam.org, describes their mission as follows:

> SHPAM endeavors to drive diversification and democratization of power production in Myanmar. With support from REAM, SHPAM will accomplish this goal through a grassroots, scalable practice-to-policy approach, in tandem with domestic and international stakeholders.

Through the powers of collective action, he and his group of fellow micro-hydro developers drafted a proposal that they intended to send straight to the DRD, bypassing the regional government in an attempt to test out the institutional capacity of the horizontal RE-implementation mechanism. Patrick told me that this was done at the urging of REAM and U Aung Myint, as they also wanted to test the power of collective organizing at the micro scale. Astoundingly, this action was the first contact ever made between the DRD and the private sector. Keep in mind, private developers such as U Khun Kyaw have been implementing RE-based DES's all over the country for almost three decades.

Unfortunately, after submitting SHPAM's proposal through the mail, U Khun Kyaw did not receive any reply for several weeks. So, he and a few other core SHPAM members decided to travel to the capital, Naypyidaw, to present their proposal directly to the DRD director. In a tragic turn of events, the director dismissed them almost

immediately and hardly even glanced at their proposal. However, after a few weeks they received notice that their project would be partially funded. In another historic first, this marked the first time that the government tended a RE-based DES through the private sector.

SHPAM is, to the best of my knowledge, the only association of its kind in Myanmar. They are organized around the common purpose of uniting micro-hydro developers around the country in their efforts to form a functional private sector. The fundamental idea behind this concept is that these developers have the knowledge base and the will necessary to keep developing small hydro resources for rural electrification purposes. If the national government does not have the capacity to develop these resources on its own, the private sector can fill in the gap – as long as the government can be convinced to provide initial capital investments and the necessary tariff structures, the developers will be able to earn income while the grid expansion process occurs. Once the grid reaches the project area, the developer will then be able to sell the energy back to the grid and maintain operations as needed (Kumara 2015). This approach accomplishes the goals of mesolevel development because it promotes the inclusive, regional development of bottom-up resources while more effectively utilizing resources and knowledge flows from the top-down institutional structures.

3.4.3 COLLABORATIVE EFFORTS TOWARDS POLICY AND REGULATORY FRAMEWORKS: FACILITATING THE INTEGRATION OF DES'S WITH THE CGS

If SHPAM's attempts to develop a private sector of small RE-based DES's are to be successful, the government of Myanmar must devise a set of standardized legal and

regulatory frameworks that outline the integration process into the national grid. Without these frameworks, as this paper has shown, grid expansion will simply render these projects obsolete and effectively crush all hopes of an integrated multi-scale energy future. Ross (2015) and Greacan (2014) have outlined the current attempts that are being made to this effect.

From a legal standpoint, the most relevant law to this discussion is Myanmar's Draft Electricity Law, which was passed in 2014. There is a multitude of language in this law that directly relates to what Greacan calls small power producers (SPP's), which are essentially the DES developers that have been discussed throughout this paper. The Electricity Law seeks to increase foreign and local investment in energy projects, and codifies small-scale projects as enterprises, which should better direct these funds to their associated DES projects. While the law still lacks clear rules or detailed guidelines as to how DES's will be integrated in the CGS, the relevant ministries have been working with experts from the World Bank and the ADB to identify solutions (Ross 2015, 11).

This collaboration with industry experts is an important step to achieving a mesolevel development approach. Often times the policies that direct the actions can have a far greater impact than the laws themselves, and the fact remains that the top-down institutions retain some of the brightest development and legal minds in the world. While I am certainly advocating for increased knowledge sharing, that does not mean that I am attempting to delegitimize the knowledge systems formed out of the bottom-up approach. Rather, it is the emphasis on collaboration that excites me,

especially when considering the amount of written resources that WB and ADB economists have access to. For example, Greacan (2014) not only outlines his recommendations for a regulatory framework that would support SPP's and remove risk from the investment climate, but he also provides several different resources on comparative examples from around the world. It is this attempt to place his expertise in a global context rather than a specific local context, that allows his participation in this process to be understood as merely informative rather than, say, colonial. If a mesolevel development approach is to be executed smoothly, these issues must be constantly considered, especially considering the often-problematic history surrounding Northern involvement in Southern affairs.

SECTION 4: IMPLICATIONS AND LESSONS FROM MYANMAR: THE NEED FOR EMBEDDED MESOLEVEL DEVELOPMENT STRUCTURES

Sections 1-3 have hopefully left us with a sense for how the combination of development forces and energy structures can lead to a wide variety of outcomes. It should be clear that both the top-down and bottom-up approaches have inherent advantages and disadvantages, and that a heavy reliance on one or the other may be insufficient to achieving outcomes that are comprehensive and effective at both the national and local levels. While we have seen how the top-down approach can be rely too heavily on its embedded ideologies and conservative financial prescriptions, we have also seen how a purely bottom-up approach can lead to insufficiencies in the pursuit of financial resources, government policy support and advanced knowledge systems. My experiences in learning about Myanmar's electrification efforts and

engaging with them firsthand has convinced me that there is an urgent need for a more concerted effort to achieve a mesolevel approach, and hopefully you the reader have come to similar conclusions. While the mesolevel development approach is indeed necessary, it can often exist in a very ad hoc manner, much in the way the bottom-up approach does. This certainly has its advantages for flexibility, but it can also be a barrier to a sustained mesolevel effort. This final section will explore ways that the mesolevel approach may be embedded in social and economic structures, so that as the achievement of this middle ground is less of an effort and more of a reflex.

4.1 BEYOND ELECTRICITY: INTEGRATED COMMUNITY ENERGY SYSTEMS

One form of advanced DES that has been pointed to, as a stepping-stone towards a comprehensive multi-scale national energy infrastructure, is an integrated community energy system (ICES). While this is similar to a micro-grid in concept, as it aims to connect multiple DER's into a single energy network, it goes beyond the micro-grid in that it implies an additional measure of local planning, implementation and governance. In this way, the community is far more involved in its energy system, and can better manage the balance of demand and supply. ICES's can also be modified to incorporate gas and heat networks as well, bringing multiple energy networks under one community-developed policy and management umbrella (Koirala et al. 2015). An ICES can come in many forms, and could see a local community manage energy generation, storage and demand response, collective purchasing and/or energy exchange and trading (Koirala et al. 2015).

The basic concept behind an ICES is the coordination of multiple different scales of DER's by a community, giving them agency over their generation options, local market structure and purchasing or selling abilities – in developing countries specifically, this allows for easier cooperation with an expanding national grid as it reaches rural communities. The beauty of this structure is that community control will allow these ICES's to exist in tandem with a centralized grid, rather than see it simply succumb to the allure of the grid's cheap, subsidized fossil-fuel based energy. As this model becomes more widespread throughout a country's non-urban areas, one can begin to see the beginning structure of an exciting, and many believe highly necessary, energy network. ICES's are inherently better poised to engage with development issues at a more mesolevel approach, as the coordinated community will have more power to resist and reconcile with top-down forces, while also participating in multiple scales of energy networks.

4.2 THE MESOLEVEL'S ROLE IN ENVIRONMENTAL MANAGEMENT: PUTTING DELIBERATIVE DEMOCRACY TO EFFECTIVE USE

This final section carries significant importance. It is here that I will attempt to break down how the mesolevel is fundamentally necessary in the functioning of democratic decision making, and therefore by extension an essential approach in the pursuit of equitable, inclusive policies that acknowledge as many voices and perspectives as possible throughout the process of their conception. In order to explore this concept I will be breaking this section down into two subsections. The first will use the backdrop of Papua New Guinea's decentralized political structure to examine how

the leveling of political hierarchies can more effectively engage the populous and guarantee wider participation in decision-making processes. The second subsection will use the context of environmental governance to demonstrate the wide-ranging effects of this deliberative democracy, and essentially show how the mesolevel approach is the critical foundation of all of this. This paper has addressed a multitude of topics, and this section should be taken as a conclusion of sorts, as it gets at the heart of the importance of a mediated, mesolevel approach in the context of everything from development to the sharing of resources – ultimately, problem solving.

4.2.1 PAPUA NEW GUINEA IN FOCUS: THE EFFECTS OF A MESOLEVEL APPROACH TO DEMOCRACY

This subsection will be drawing exclusively from a single source, Diana Conyer's chapter in the book Development from Above or Below? The Dialectics of Regional Planning in Developing Countries, edited by Walter B. Stohr and D.R. Fraser Taylor. Conyer's chapter is entitled *Papua New Guinea: Decentralization and Development From the Middle*. It is primarily concerned with Papua New Guinea's "creation of a new tier of government, known as provincial government, and the decentralization of a large number of government powers and functions to the new provincial governments (210)."

The provincial government discussed within this chapter is a perfect example of a mesolevel approach to governance, in that it attempts to utilize a central government's fundamental structures, but disperse them in a way that allows for increased participation from individuals and communities. Increased democratic participation in this context is seen "not only as a means of achieving social and

economic development at the provincial level, but also as a very important end in itself (233).” One meausure that Conyer uses to assess this strategy’s ability to engage the populous in the democratic process is the proliferation of provincial level politicians. The decentralization of the government allows for the creation of far more political positions, allowing for increased opportunity to both hold a position and develop a close relationship with someone in a political position. In addition, she describes how her experiences with this system have led her to believe that “provincial politicians are more concerned than the national government to develop an effective system of local-level government and to improve other links with the villages (224).” She mainly attributes this phenomenon to the fact that provincial politicians are inherently closer to their constituents and therefore more in tune to their needs and the unique conditions of their lives. There is also the increased potential for the provincial governments to extend decision-making powers all the way down to the village level, which has extremely positive implications for the implementation of successful rural development programs.

4.2.2 MESOLEVEL DELIBERATIVE DEMOCRACY AND ITS ESSENTIAL ROLE IN BUILDING COMMON PURPOSE

This subsection will also rely exclusively on a single source to build this argument: James Meadowcroft’s chapter *Deliberative* Democracy in a book entitled Environmental Governance Reconsidered: Challenges, Choices and Opportunities, which is edited by Robert F. Durant, Daniel J. Fiorino, and Rosemary O’Leary.

The decentralized government structure of Papua New Guinea is good introduction to

the concept of deliberative democracy because they both generally have the same goals in mind. The provincial governments of Papua New Guinea are designed to maximize the participation in and engagement with government and decision-making process. Likewise, the concept of deliberative democracy is far more concerned with the process of "public deliberation of citizens (184)" than with "aggregative (184)" visions of the democratic process that rely on ballot boxes to select preferred outcomes. Essential to this concept is the condition that all "concerned interests should have access to the process . . . systematic bias on the basis of class, race, religion, gender, and so on must be precluded." Meadowcraft is also very careful to point out that the mesolevel, which he defines as the zone "where state and society overlap and interpenetrate," is the most appropriate level through which to consider deliberative democracy.

Meadowcraft goes on to outline how group-based deliberative processes are especially well suited to address "some of the most challenging characteristics of contemporary environmental problems." He points to group processes as being able to 1) engage complex interests within a constructive framework; 2) provide a context to explore contradictory scientific claims and to reconcile different forms of knowledge; 3) favor long-term interaction; and 4) encourage learning among organizations and broader social constituencies.

These advantages are essential to tackling problems that are far more complex than the entry-level environmental issues. For example, Meadowcraft specifically identifies the transition to a postcarbon energy system as needing this type of thinking and group-based deliberative approach. The mesolevel effectively considers the entire range of possibilities and perspectives, but it is ultimately the practitioner, the employer of the approach that must put it into practice. Structures can help, but actors will forever remain the driving force behind change.

References

Abdalla, J.S. 1978. "Heterogeneity or differentiation – the end of the Third World?" *Development Dialogue*, 2: 3-21

Allan, David. Interview by author. Digital recording

Allen, Joshua, William R. Sheate, and Rocio Diaz-Chavez. 2012. "Community-Based Renewable Energy in the Lake District National Park – Local Drivers, Enablers, Barriers and Solutions." *Local Environment* 17 (3): 261–80. doi:10.1080/13549839.2012.665855.

Anonymous. 1999."Bringing Power to the People: Promoting Appropriate Energy Technologies in the Developing World." *Environment* 41 (5): 12 – 41.

Baum, Warren C. and Stokes M. Tolbert, 1985. *Investing in Development: Lessons of World Bank Experience*. Oxford University Press.

Castalia Strategic Advisors. 2014. "Myanmar National Electrification Program Roadmap and Investment Prospectus: Final Roadmap and Investment Prospectus." September. www.castalia-advisors.com

Department of Rural Development. "National Electrification Plan: Off-Grid Rural Electrification." January 28, 2016.

Earth Institute, Sustainable Engineering Lab, Columbia University, "Myanmar National Electrification Plan (NEP): Least-Cost Geospatial Electrification Planning Results, August 2014.

Encyclopedia Britannica, "Myanmar: History," http://www.britannica.com/place/Myanmar/History

Flavin, Christopher and Nicholas Lenssen. 1994. "Powering the Future: Blueprint for a Sustainable Electricity Industry." *Worldwatch Institute* 119, June: 5 – 61.

Fox-Penner, Peter. 2010. *Smart Power: Climate Change, the Smart Grid and the Future of Electric Utilities*. Washington, D.C.: Island Press.

Fraser, Evan DG, Andrew J. Dougill, Warren E. Mabee, Mark Reed, and Patrick McAlpine. 2006. "Bottom up and Top down: Analysis of Participatory Processes for Sustainability Indicator Identification as a Pathway to Community Empowerment and Sustainable Environmental Management." *Journal of Environmental Management* 78 (2): 114–27.

Fues, Thomas, Li Dongyan, and Martina Vatterodt. 2007. "The Role of the United Nations in the Global Development Architecture: Steps towards Greater Coherence." In *Annual Meeting*, 6–8. http://www.die-gdi.de/uploads/media/Download_the_full_text__74_kb__01.pdf.

Glemarec, Yannick. 2010. "Financing the Transition to a Low-Carbon Society." *Journal of Renewable and Sustainable Energy* 2 (3): 031013. doi:10.1063/1.3459135.

Greacan, Chris. 2014. "SPP Regulatory Framework Options in Myanmar: Final Report to the International Finance Corporation." July: 1-20.

Haanpaa, L. 2005. "Structures in sustainable consumption research: macro- and micro-level factors affecting environmentally responsible consumption." *Conference Paper presented at 7th Conference of the European Sociological Association*, 9-12 September.

Hansen, Niles M. "Development from Above: The Centre-Down Development Paradigm." *Development from Above or Below? The Dialectics of Regional Planning in Developing Countries*, edited by Walter B. Stohr and D.R. Fraser Taylor, 15-36. John Wiley & Sons Ltd., 1981.

Helleiner, Eric. 2014. *Forgotten Foundations of Bretton Woods: International Development and the Making of the Postwar Order.* Ithaca, NY: Cornell University Press

Hennig, Thomas, Wenling Wang, Yan Feng, Xiaokun Ou, and Daming He. 2013. "Review of Yunnan's Hydropower Development. Comparing Small and Large Hydropower Projects Regarding Their Environmental Implications and Socio-Economic Consequences." *Renewable and Sustainable Energy Reviews* 27 (November): 585–95. doi:10.1016/j.rser.2013.07.023.

International Energy Agency, "Access to Electricity," IEA - Access to Electricity, 2012, http://www.worldenergyoutlook.org/resources/energydevelopment/accesstoelectricity/

International Energy Agency. 2015. *Energy access database*. April 28, 2016. http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/

Koirala, Binod Prasad, Elta Koliou, Jonas Friege, Rudi A. Hakvoort and Paulien M. Herder. 2015. "Energetic communities for community energy: A review of key issues and trends shaping integrated community energy systems." *Renewable and Sustainable Energy Reviews* 56 (2016): 722-744.

Kumara, P.G. Ajith, "Report of Off-Grid Hydro Power Assessment of Myanmar," January 2015

Nam, Kee-Yung, Wena M. Cham, and Paulo Rodelio Halili. 2015. "Power Sector Development in Myanmar." *Asian Development Bank Economics Working Paper Series*, no. 460. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2708829.

National League for Democracy. "2015 Election Manifesto: Authorised Translation."

Neves, Diana, Carlos A. Silva, and Stephen Connors. 2014. "Design and Implementation of Hybrid Renewable Energy Systems on Micro-Communities: A Review on Case Studies." *Renewable and Sustainable Energy Reviews* 31 (March): 935–46. doi:10.1016/j.rser.2013.12.047.

Posner Ross, Rachel. "Myanmar's Path to Electrification: The Role of Distributed Energy Systems." *Energy & National Security*, October (2015): 1-17.

Ranaboldo, Matteo, Bruno Domenech Lega, David Vilar Ferrenbach, Laia Ferrer-Martí, Rafael Pastor Moreno, and Alberto García-Villoria. 2014. "Renewable Energy Projects to Electrify Rural Communities in Cape Verde." *Applied Energy* 118 (April): 280–91. doi:10.1016/j.apenergy.2013.12.043.

Reid, Louise, Phillip Sutton and Colin Hunter. 2010. "Theorizing the meso level: the household as a crucible of pro-environmental behavior." *Progress in Human Geography* 34 (3): 309 – 327.

Sithu Aung Myint. "The NLD's Three Big Challenges." *Frontier Myanmar*. April 24, 2016. http://frontiermyanmar.net/en/the-nlds-three-big-challenges.

Stein, Howard. 2008. *Beyond the World Bank Agenda: An Institutional Approach to Development*. Chicago: The University of Chicago Press, Ltd.

Steve Herman. "Huge Proposed Hydropower Dam in Myanmar Draws Local Opposition." *Voice of America*. June 10, 2015. http://www.voanews.com/content/huge-proposed-hydropower-dam-in-myanmar-draws-local-opposition/2815474.html

Stevens, Kris, and John Morris. 2001. "Struggling toward Sustainability: Considering Grassroots Development." *Sustainable Development* 9 (3): 149–64.

Stohr, Walter B. "Development from Below: The Bottom-Up and Periphery-Inward Development Paradigm*." *Development from Above or Below? The Dialectics of Regional Planning in Developing Countries,* edited by Walter B. Stohr and D.R. Fraser Taylor, 39-69. John Wiley & Sons Ltd., 1981.

Terrapon-Pfaff, Julia, Carmen Dienst, Julian König, and Willington Ortiz. 2014. "A Cross-Sectional Review: Impacts and Sustainability of Small-Scale Renewable Energy Projects in Developing Countries." *Renewable and Sustainable Energy Reviews* 40 (December): 1–10. doi:10.1016/j.rser.2014.07.161.

Trainer, Ted. 2010. "Can renewables etc. solve the greenhouse problem? The negative case." *Energy Policy* 38 (8): 4107-4114

Una Galani. "Myanmar's 'Lady' Faces Challenge of a Lifetime." *Reuters Breakingviews*. February 24, 2016. http://blogs.reuters.com/breakingviews/2016/02/24/myanmars-lady-faces-challenge-of-a-lifetime/.

United Nations, "UN Charter," http://www.un.org/en/sections/un-charter/un-charter-full-text/index.html

Uphoff, N.T. and M.J. Esman. 1974. "Local Organization for Rural Development: Analysis of Asian Experience." *Rural Development Committee,* Center for International Studies: Cornell University

WWF Global, "Consultation Workshop for Power Sector Vision in Myanmar," August 19, 2015, http://wwf.panda.org/wwf_news/?251073/Consultation-workshop-for-Power-Sector-Vision-in-Myanmar