

# Low Carbon Development: What is in it for us?

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2014

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Philippines.

Submitted to the World Bank eInstitute for the e-course  
**Low Carbon Development – Integrated Course**

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For inquiries, the contact details of the author are on the back cover.

*Photo on the cover page: Bangui Windmills, Ilocos Norte, Philippines [Mary Anne Velas-Suarin]*

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# CHAPTER ONE

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## Background

### 1. Why this paper?

This brief paper is a submission in the e-course, **Low Carbon Development –Integrated Course**, an e-learning course provided by the World Bank eInstitute. The author participated in the 29 April to 19 May 2014 run of this course. Details on this e-course are given in the next section.

As a final project required by the course, the participants had been advised to work on the following:

1. Development of a draft low carbon development (LCD) plan for the country which they have selected following the outline provided by the course facilitators; and
2. Discussion of issues on LCD in the three key sectors, namely, power, household and transport sectors, with attention given to potential, stakeholders, data, and work plans.

### 2. Limitations of the paper

As the development of a low carbon development plan normally involves exhaustive data gathering, modeling, and consultation and validation work, this paper does not aim to provide a full-blown plan or a complete picture. Similarly, the e-course ran for three weeks only, thus, this paper will only attempt to offer insights and reflections, which can be good starting points for the development of such a plan in the future.

The author had also proposed, at the start of the e-course, that instead of a national low-carbon plan, it will be more useful to develop something that will be simpler and evolving at the household level. It may also be no longer necessary to 'reinvent the wheel', so to speak, as the Philippines already began the project, *Building Momentum for Low Carbon Development*, through World Wildlife Fund (WWF)-Philippines, Department of Energy (DOE), Climate Change Commission (CCC), and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

More importantly, "any societal transformation requires a personal commitment" (Velas-Suarin, 2014). Therefore, for this project, the author looks at the viability of solar energy at the household level. A specific section (Chapter 4), will therefore, discuss the viability of solar energy at the household level, using data from seven (7) households as a sample starting point. This chapter will be very useful for households who want to understand the application of renewable energy

(particularly, solar energy) more and in the process facilitate their decision-making (particularly from a simple *cost vs. benefit* analysis). The author does not consider this paper as “merely an intellectual exercise but rather as a simple way to shell out a practical output—one that can benefit interested people and communities even in a small scale. It is hoped that, ultimately, this can be applied on a wider scale later on, of course, given that small ideas do create ripple effects” (Velas-Suarin, 2014).

This paper will cover the following topics: (i) a background of this paper and the WBI e-course; (ii) low carbon development in the Philippines; (iii) reflections for low carbon development planning, with particular focus on the power, household, and transportation sectors in the Philippines; and (iv) the viability of solar energy at the household level.

### 3. The Low Carbon Development – Integrated Course

The **Low Carbon Development – Integrated Course** introduces the participants to climate change mitigation, explores the concepts surrounding low carbon development planning on an economy-wide basis, and takes a detailed look at what this means in the power and transport sectors and for household electricity use (World Bank eInstitute, 2014).

The course also utilizes and introduces the participants to the modeling tool, **Energy Forecasting Framework and Emissions Consensus Tool (EFFECT)**. The course provides participants with step-by-step instructions on how to use the model, which is based in Microsoft Excel. EFFECT was developed initially for low carbon modeling work in India and eventually used in a number of other countries.



A screenshot of a portion of the e-course's homepage in the Moodle site. [Image: World Bank eInstitute.]

The course discusses the development of reference and low carbon scenarios up to 2030 and beyond, the stakeholders that need to be involved, and the data that is required to develop credible projections (World Bank eInstitute, 2014).

This course covers the following modules:

- (i) Introduction to Low Carbon Development Planning
- (ii) Overview for Policymakers
- (iii) Power Sector
- (iv) Household Sector
- (v) Transport Sector
- (vi) EFFECT Model

Target participants include policymakers, planners, modelers, and development practitioners. For the batch where this author is a part of, the class is composed of more than 250 development professionals.

# CHAPTER TWO



## Low Carbon Development in the Philippines

### 1. Country Profile: Philippines

#### The Philippines and climate change

The Philippines is an archipelago of over 7,000 islands and located in the area called the 'Pacific Ring of fire', often called as such because of its numerous earthquakes and volcanic eruptions. The Ring of Fire, located along "the edges of one of the world's main tectonic plates (the Pacific Plate) contains over 450 volcanoes and is home to approximately 75% of the world's active volcanoes.



The Pacific 'ring of fire.' [Image credits: The World Atlas and GraphicMaps.com]



Map of the Philippines. [Image credit: GeoCurrents]

Nearly 90% of the world's earthquakes occur along the Ring of Fire; most recently, the devastating quakes in Chile, Japan and New Zealand" (World Atlas, n.d.).

The Philippines is often described as Asia's 'typhoon mat.' It is home to over 92.34 million people (NSO, 2010). The country's location and characteristics make it highly vulnerable to climate change and natural hazards.

The climate of the Philippines is tropical and maritime and characterized by relatively high temperature, high humidity, and abundant rainfall (PAGASA, n. d.). The coolest months are normally experienced in January to February while the warmest months often occur in April and



May. The Philippine Atmospheric, Geophysical, and Astronomical Administration Services (PAGASA)—the country’s key government agency for weather forecasting, flood control, astronomical observations, and time service—has indicated an average temperate of 28.3°C for May although this month’s temperature has been reaching as high as 34 to 37°C in some provinces including Isabela and Metro Manila.

There are two seasons in the country, the wet and the dry seasons, based upon the amount of rainfall. The average monthly relative humidity varies between 71 percent in March and 85 percent in September (PAGASA, n.d.).

Living in the Philippines means having to deal with typhoons, which occur about twenty times in a year. According to the UN Office for Co-ordination of Humanitarian Affairs (OCHA), the Philippines has experienced about 182 disasters since 2002, in which almost 11,000 people have died (Tisdall, 2013). This figure does not include last year’s super-typhoon Haiyan, which caused the loss of more than 6,300 lives and which led to economic losses of about PhP 89.6 billion or roughly US\$ 2 billion (NDRRMC, 2014).

Climate change certainly stares hard at the Filipino people but it seems that it is still a misunderstood concept. It is either that or the people do not yet see it as something that affects them profoundly on a very personal level. The author shares her earlier reflections on this matter:

*I think that environmental issues and concerns, in general, still do not seem to catch the attention of many people because they are misconstrued as ‘being high up there.’ They are not as ‘emotional’ or dramatic as issues on domestic violence, human rights, and even poverty. Show someone pictures of a malnourished child and a denuded forest and most likely, he will choose the picture of the hungry child as more urgent... and more moving.*

*‘Environmental protection’ and ‘climate change’ have seemingly become mere buzz words. They are more the concerns of developed countries; they are things that can wait because we need to feed our families first.*

*...I believe not only in the urgency of climate change but also in making it ‘closer’ to the hearts and minds (and stomachs!) of the people. It should be seen as intrinsically connected to poverty issue and how should we authentically address it (Velas-Suarin, 2013).*

Climate change, somehow, has a certain ‘disconnect’ to development vis-à-vis the perception of ordinary people. People may become ‘emotional’ after experiencing super typhoons. However, when the suffering has subsided, we tend to go back to our daily grind, not really understanding why climate change is connected to the core of the development process. In the same breathe, how can we make people appreciate low carbon development—as among the approaches for addressing



Aftermath of super typhoon Yolanda. How many more super typhoons must we experience before we finally consider climate change as something very personal? [Photo credits: Philippine Red Cross-Cebu and PDI online edition.]



and dealing with climate change? Admittedly, low carbon development is still an unfamiliar term to most people. It is not something ‘close to the hearts’ of the people. This paper will continue this discussion in Chapter 4. Meanwhile, understanding the Philippine situation requires looking at some demographic and economic data.

### Some demographic and economic data

Using 1.89 annual growth rate, the current population of the Philippines is estimated at 100.6 million (World Population Review, 2014) although the latest official data placed it at over 92.34 million people (NSO, 2010).

The National Capital Region (“NCR”) or Metro Manila has a population of about 11.86 million (NSO, 2010) and covers an area of about 636 square kilometers. Metro Manila is divided into 17 local government units (LGUs) comprising of 16 cities and one municipality. Quezon City, the most populated city in Metro Manila, is host to about 2.76 million residents (NSO, 2010).

Two other cities already surpassed the ‘one-million mark’: City of Manila with its 1.65 million residents, and Caloocan City with 1.49 million. Outside the NCR, only Davao City has a population of more than one million (1.45 million) (NSO, 2010).

The employment rate in January 2014 is estimated at 92.5 percent. Table 1 shows the latest government estimates.

Table 1. Employment rate in the Philippines (2013-2014)

<b>Philippines</b>	<b>January 2014<sup>1/</sup></b>	<b>January 2013<sup>2/</sup> (Excludes Region VIII)</b>	<b>January 2013 (Includes Region VIII)</b>
<b>Population 15 years and over (in 000)</b>	<b>61,775</b>	<b>60,741</b>	<b>63,720</b>
<b>Labor Force Participation Rate (%)</b>	<b>63.8</b>	<b>64.1</b>	<b>64.1</b>
<b>Employment Rate (%)</b>	<b>92.5</b>	<b>92.9</b>	<b>92.9</b>
<b>Unemployment Rate (%)</b>	<b>7.5</b>	<b>7.1</b>	<b>7.1</b>
<b>Underemployment Rate (%)</b>	<b>19.5</b>	<b>20.7</b>	<b>20.9</b>

<sup>1/</sup> Estimates for January 2014 are preliminary and may change.

Region VIII was not covered in the January 2014 LFS.

<sup>2/</sup> Calculation of the January 2013 estimates excludes data from Region VIII to make the estimates for the two rounds comparable.

Source: Philippine Statistics Authority (formerly, NSO), March 2014.

The Philippines is mainly a service-oriented and agricultural country with more than 80% of its labor force employed in these two sectors. According to the government’s latest estimate, the service sector employs about 53%, the agriculture sector about 32%, and the industrial sector about 15% (NSO, 2010).

Mainly driven by the desire to improve their lives through higher income and better working opportunities, many Filipinos leave their families to work overseas. Government data revealed that the number of Filipinos deployed overseas in 2012 reached over 2.2 million (PSA, 2013).

Meanwhile, the gross domestic product is estimated at 7.8 for the 4th quarter of 2013. Table 2 shows a snapshot of the Philippine economy.

Table 2. Philippine economic indicators

<b>Indicator</b>	<b>Latest</b>	<b>Previous</b>	<b>Year Ago</b>
Gross National Income	7.8 (4Q 2013)	8.1 (3Q 2013)	6.4 (4Q 2012)
Gross Domestic Product	6.5 (4Q 2013)	6.9 (3Q 2013)	7.1 (4Q 2012)
Exports	US\$5.2 billion (March 2014)	US\$4.6 billion (Feb 2014)	US\$ 4.7 billion (March 2013)
Imports	US\$4.72 billion (Feb 2014)	US\$5.95 billion (Jan 2014)	US\$4.71 billion (Feb 2013)
Headline Inflation Rate	4.1 (April 2014)	3.9 (Mar 2014)	2.6 (April 2013)
Core Inflation Rate	2.9 (April 2014)	3.9 (Mar 2014)	3.1 (April 2013)
Underemployment Rate	19.5% (Jan 2014)	17.9% (Oct 2013)	20.7% (Jan 2013)
Unemployment Rate	7.5% (Jan 2014)	6.5% (Oct 2013)	7.1% (Jan 2013)

Source: NEDA and NSCB (2014).

Despite the seemingly improving growth rate, there are indicators of continuing (and worsening) poverty. The National Statistics Coordination Board (NSC) reported that poverty rates have remained almost unchanged since 2006. In the first half of 2012, the national poverty rate stood at 27.9%, compared to 28.8% in 2006 and 28.6% in 2009 (PSA and NSCB, 2014). Furthermore, the subsistence incidence among Filipino families (the proportion of Filipino families in extreme poverty) was estimated at 7.7 percent during the first semester of 2013 (PSA and NSCB, 2014). Meanwhile, the figures could even be higher because the "poverty threshold" used by the government agency is merely \$0.62 per day, while that of the World Bank is \$1.25 per day (Heydarian, 2013).

## 2. Low carbon development: In a nutshell

The idea of "low carbon development" (LCD) was first used during the Rio Convention of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. Low carbon development is now generally expressed using the term low-emission development strategies (LEDS), which is also known as low-carbon development strategies or low-carbon growth plans (UNESCAP, n.d.). This strategy is being taken by developing countries that aspire "to adopt low carbon development pathways to achieve green growth, reduce their dependency on fossil fuels, and contribute to global efforts on climate change mitigation" (ESMAP, n.d.). LEDS and LCD are often used to describe national economic development plans that consider low-emission strategies, support climate change mitigation and adaptation goals, and promote "green" economic growth.

Stakeholders who are paving the way towards an LCD path work together to ensure that appropriate policy initiatives are well established and understood. South Korea, for example, is being guided by the following key policy objectives for 2050:

1. Mitigation of climate change and energy independence, with focus on reducing greenhouse gas emissions, reducing fossil fuel use, and enhancing energy independence; and strengthening capacity to adapt to climate change;
2. Creation of new engines for economic growth, with focus on developing green technologies, 'greening' existing industries, promoting green industry, advancing industrial structure; and developing the structural foundations for a green economy; and
3. Improvement in quality of life and enhancement of international standing, with focus on 'greening' the land and water, creating green transport infrastructure, bringing the green revolution into daily life; and becoming a role model for green growth (UNEP, 2010).

### 3. Low carbon development in the Philippines

The Philippines, being an archipelagic nation, is considered as among the most threatened countries in the world. In fact, according to the Inter-governmental Panel on Climate Change (IPCC), an increase in annual rainfall and rainfall variability in the Philippines since the 1980's are already being observed and these trends are expected to cause the most serious impacts in the future. It had been ranked as the highest country in the world in terms of vulnerability to cyclone occurrence (CCC, 2011). The Philippines will continue to expect an increase in extreme weather events—the most recent is super typhoon Haiyan—including tropical cyclones and droughts. Natural disasters in the last 20 years had affected 80 million people, making it as a country with one of the highest levels of mortality risk, scoring 8 out of 9 from the UNISDR's Mortality Risk Index (CFU, 2011). Sea level rise is expected and this will significantly impact residents in coastal areas. Climate change is a day-to-day reality in the Philippines and significantly causing challenges and difficulties in agriculture, fisheries, manufacturing, and industries.

The Philippines' CO<sub>2</sub> emissions have increased substantially since 1960, although there has been somewhat of a plateau in their growth since 1996 (CFU, 2011). Table 3 shows the total GHG emissions for 2000 while Figure 1 shows the historical GHG emissions from 1999 to 2009.

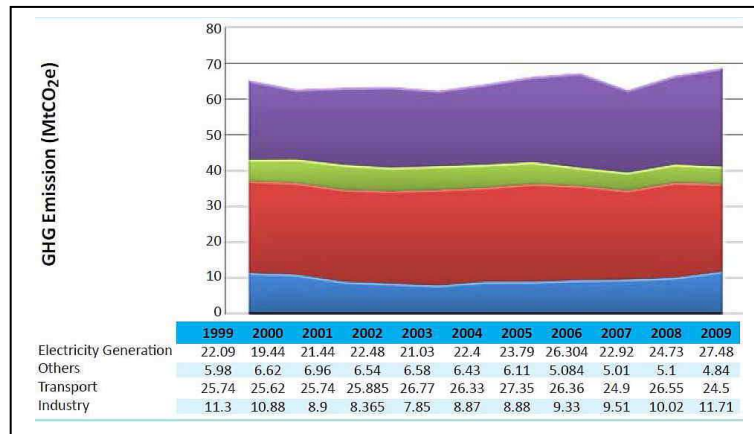
Table 3. Total GHG Emissions (2000)

Total GHG Emission (GgCO <sub>2</sub> e), 2000	
Sector	GHG Emission (GgCO <sub>2</sub> e)
Energy	69,667.24
Industrial Processes	8,609.78
Agriculture	37,002.69
Land Use Change and Forestry (LUCF)	-105,111.37
Waste	11,599.007
Total GHG Emission	21,767.41

Source: National Climate Change Action Plan (Climate Change Commission, 2011).

Figure 1.  
Historical GHG  
emissions (1999-2009)

Source:  
National Climate Change  
Action Plan (Climate  
Change Commission, 2011).



## Climate change and low carbon development

The Philippines, being a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, has put in place laws and regulations to address climate change and environmental challenges. For example, it has enacted the Climate Change Act in 2009 and established the Climate Change Commission. This law was amended in 2012 to make way for the establishment of the Peoples Survival Fund, a financing mechanism for projects that address climate change.



The Bangui Windmills, Ilocos Norte, Philippines. [Photo credit: M. Velas-Suarin]

Through the works of the Climate Change Commission, Department of Environment and Natural Resources (DENR) and other stakeholders, the country has developed the National Framework Strategy on Climate Change (NFSCC) and the Philippine Strategy on Climate Change Adaptation (PSCCA). Both of these frameworks have been integrated in the Philippine Development Plan (PDP) 2011-2016.

A long-term National Climate Change Action Plan (NCCAP) for 2011-2028 was also recently developed. This plan “emphasizes adaptation to climate change and defines the transition to a climate-smart development,

whereby first steps towards a low-carbon trajectory are being made” (GIZ, 2010).

Recently, WWF-Philippines, DOE, CCC, and GIZ partnered for the project, *Building Momentum for Low Carbon Development*, which seeks “to develop the country’s multi-sectoral low-carbon plans (LCPs) and build the expertise of key civil society organizations on climate change mitigation” (Feliciano, 2014).

This project recommends plans to synergize national development objectives with climate change mitigation strategies, particularly through a path from a fossil-fuel dependent economy to one that uses 100% renewable energy (RE) by 2050. This will be done through steps such as increasing investments in RE and Energy Efficiency (EE), while decoupling the country’s dependence on

imported fossil fuels like coal and oil (WWF, 2014). (Note: Efforts had been made by this author to request a copy of the study or its latest draft/report, however, no response had been received as of the time of this writing.)

## A snapshot of stakeholders in the Philippines

Any intervention—both in the policy and programmatic levels—requires the meaningful engagement of stakeholders. The Philippines is lucky in the sense that it has a very vibrant civil society sector. Name one issue and one can randomly connect certain campaigns or organizations to it – for example, “Bantay Bata” (loose translation: “Watching out for kids” or “looking after kids”) for child abuse, “Piso Para sa Pasig” (loose translation: “One peso for Pasig”) for the clean-up of Pasig River, or “GABRIELA”<sup>1</sup> for women’s rights.

However, this advantage sometimes becomes a barrier particularly in situations where bigger bases or groups of stakeholders are involved. Consensus building becomes all the more challenging the deeper people and organizations are getting involved. However, such a challenge should be considered as part and parcel of a genuine consensus building. Table 4 provides a snapshot of Philippine stakeholders in the three sectors covered in this paper. Obviously, it is difficult and impossible to assign/categorize stakeholders into specific sectors because many have interconnecting and related stakes in all of the sectors (e.g., Departments of Energy and Environment and Natural Resources). Nevertheless, this representation should help in getting a quick picture of who are involved.

Table 4. Philippine stakeholders

Power	Transportation	Household
<p><b>Government</b></p> <ul style="list-style-type: none"> <li>Department of Energy (DOE)</li> <li>Local Governments (Provinces, Cities, Municipalities)</li> <li>Department of Environment and Natural Resources</li> <li>Climate Change Commission</li> <li>Office of the President and Philippine Congress</li> <li>National Disaster Risk Reduction and Management Council (NDRRMC)</li> <li>Department of Science and Technology (DOST)</li> <li>National Economic and Development Authority</li> <li>Department of Interior and Local Government</li> <li>Philippine National Police</li> </ul> <p><b>Civil society organizations</b> (local and international)</p> <ul style="list-style-type: none"> <li>World Wildlife Fund (WWF)</li> </ul> <p><b>Academe and research institutions</b></p> <p><b>Media</b></p> <ul style="list-style-type: none"> <li>Broadcast</li> <li>Print and online</li> </ul> <p><b>Private Sector</b></p> <ul style="list-style-type: none"> <li>Commercial banks and lending institutions</li> </ul> <p><b>Development and multilateral and bilateral organizations</b></p> <ul style="list-style-type: none"> <li>World Bank, Asian Development Bank (ADB), UN bodies like UNFCCC, United Nations</li> </ul>		

<sup>1</sup> GABRIELA stands for *General Assembly Binding Women for Reforms, Integrity, Equality, Leadership, and Action* although “Gabriela” is the first name of Gabriela Silang—the wife of a Filipino revolutionary, Diego Silang—who eventually continued the fight of her husband (after his assassination in 1763) against the Spanish colonizers.

Environment Program (and Global Environment Fund), UNDP ▪ USAID, GIZ, Japan International Cooperation Agency (JICA), SIDA, CIDA		
<b>Government</b> <ul style="list-style-type: none"> <li>▪ Energy Regulatory Commission</li> <li>▪ Power Sector Assets and Liabilities Management Corporation (PSALM)</li> <li>▪ Philippine Electricity Market Board</li> </ul> <b>Private Sector</b> <ul style="list-style-type: none"> <li>▪ Investors and Independent power producers (IPPs)</li> <li>▪ Transmission and distribution companies like Meralco</li> <li>▪ Associations like the Philippine Independent Power Producers Association</li> <li>▪ Manufacturers and distributors of RE systems and technologies</li> </ul> <b>Civil society organizations</b> <ul style="list-style-type: none"> <li>▪ Wholesale Electricity Spot Market<sup>2</sup></li> </ul>	<b>Government</b> <ul style="list-style-type: none"> <li>▪ Department of Transportation and Communications (DOTC) and attached agencies like the Land Transportation Office (LTO)</li> <li>▪ Department of Public Works and Highways</li> <li>▪ Local Governments</li> <li>▪ Metro Manila Development Authority (MMDA)</li> </ul> <b>Private Sector</b> <ul style="list-style-type: none"> <li>▪ Oil companies</li> <li>▪ Vehicle manufacturers and distributors</li> <li>▪ Emission testing companies</li> </ul> <b>Civil society organizations</b> <ul style="list-style-type: none"> <li>▪ Motorists associations</li> <li>▪ Distributors/sales associations</li> <li>▪ Drivers' associations such as Tricycles and Drivers Associations (TODAs)</li> </ul>	<b>Civil society organizations</b> <ul style="list-style-type: none"> <li>▪ Consumer rights groups</li> <li>▪ Other special interest groups</li> </ul>

UNFCCC=United Nations Framework Convention for Climate Change; UNDP=United Nations Development Program; USAID=United States Agency for International Development; GIZ= Deutsche Gesellschaft für Internationale Zusammenarbeit; SIDA=Swedish international Development Agency; CIDA=Canadian International Development Agency

There are still many stakeholders involved and this list can still be enriched in the future.

<sup>2</sup> The establishment of the WESM is part of the package of electric power industry reforms mandated in Republic Act No. 9136 or the Electric Power Industry Reform Act of 2001. In November 2003, the Philippine Electricity Market Corporation (PEMC) was incorporated as a non-stock, non-profit corporation, and was designated the following year, in August 2004, to serve as the autonomous group market operator (AGMO) that will undertake the preparations for and the initial operations of the WESM. After several months of trial operations, the WESM commenced commercial operations in the Luzon grid on 26 June 2006. Four years into the commercial operations in Luzon, the Visayas grid was integrated into the WESM and commenced commercial operations on 26 December 2010 (WESM website, accessed 18 May 2014)



# CHAPTER THREE

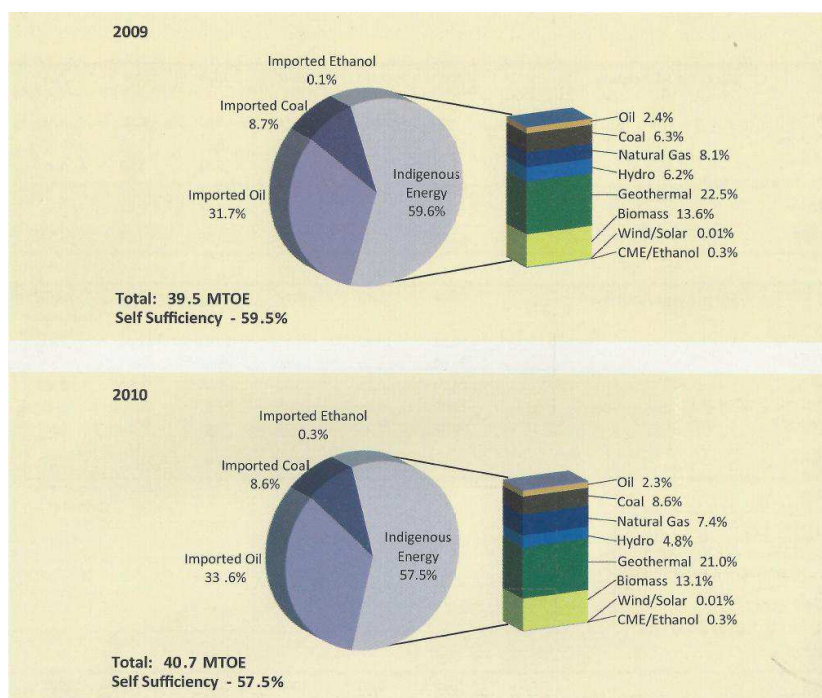


## Reflections on Low Carbon Development Planning

### 1. Power sector

Slowly but surely, the Philippines is moving away from the past of being a “net energy importer”. In recent years, it has been fulfilling its aspiration toward becoming more self-reliant in terms of its energy requirement. Figure 2 shows that in 2010, the Philippines has reached 57.5% sufficiency.

Figure 2. Philippines’ primary energy supply mix



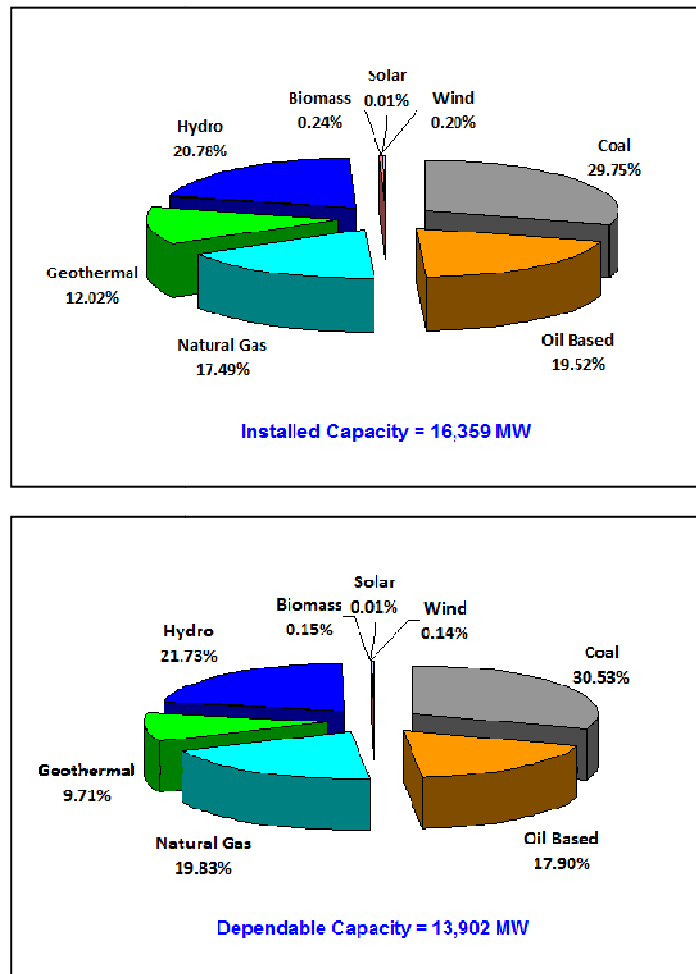
Source: Department of Energy (Philippines), 2009-2010.

In 2012, the Philippines consumed almost 19 million short tons of coal, almost half of which was imported. Coal consumption in the Philippines is projected to continue increasing due to a rise in domestic supply and increased demand from domestic coal-fired power plants, according to the Economist Intelligence Unit (US EIA, 2013).



In the power sector, the total installed and dependable capacity in the Philippines was estimated at 16,359 MW with the entry of new capacities in the Visayas and Mindanao grids (DOE, 2010). Figure 3 shows the installed and dependable capacities and the energy mix.

Figure 3. Installed and dependable capacities



Source: Department of Energy (Philippines), 2010.

### Considerations in planning for LCD in the power sector

Environmentally sound policies and strategies are already being implemented in the energy sector. As mentioned earlier, the path towards wider use of renewable energies is being paved more seriously in recent years. The Philippines is the largest producer of geothermal energy in Asia with an online capacity of 1,904 megawatts and it is estimated to have a potential of more than 4,600 megawatts of renewable energy for the next three to five years (CCCEP, 2013).

The Philippines is among the first ones in Asia to enact a Renewable Energy law. The law was signed in 2008 and became the basis for the National Renewable Energy Program (NREP). The

program aims to triple the generating capacity of renewable energies between 2010 and 2030 to a target of 15,000 Megawatts (DOE, 2014).

However, despite these policy initiatives, much work still needs to be done. For example, there is a need for stronger institutional capacities, fuller integration of laws into the local levels, and better financing. There is also a need for more meaningful coordination among stakeholders and the setting up of effective monitoring and evaluation systems for climate-focused interventions.

As this paper also looks at the household-level consumption, more attention should also be given to ways in which the general public can be encouraged to do simple acts toward low carbon lifestyles. An effective entry point is to begin “where it hurts them most” and this is in the high prices of electricity in the Philippines. This is discussed further in Chapter 4.

## 2. Transportation Sector

It was reported recently that an estimated 560,000 passengers ride the MRT train each day (Fernandez, 2014). The MRT’s capacity is up to 350,000 passengers per day only. This is probably the best example that anyone who wants to describe the state of the Philippine transportation can start from.

Indeed, the Philippines’ transportation sector badly needs intervention. In Metro Manila alone, traffic has become so bad that a Quezon City resident hoping to reach his office in Makati City at 9:00 am needs to wake up at about 5:30 am (or even earlier) to give him ample time (around 2 hours) to beat the morning rush hour. Table 5 shows the number of vehicle registration by region and while Table 6 shows the registration based on the type of vehicles. Table 6 shows that in Metro Manila alone, more than 2.7 million new vehicles registered in 2013.

Table 5. Motor vehicle registration by region

Date of Preparation: 23 January 2014						
REGION	REGISTRATION TRANS. HANDLED			% INCREASE		AVE.
	2011	2012	2013	12/'11	13/'12	%INC.
I	692,674	677,711	751,312	(2.16)	10.86	4.35
II	534,309	560,796	583,350	4.96	4.02	4.49
III	1,648,286	1,658,428	1,693,680	0.62	2.13	1.37
IV-A	1,376,794	1,479,236	1,476,219	7.44	(0.20)	3.62
IV-B	160,982	177,932	183,471	10.53	3.11	6.82
V	492,283	509,682	563,986	3.53	10.65	7.09
VI	814,360	784,003	698,031	(3.73)	(10.97)	(7.35)
VII	786,387	871,267	848,087	10.79	(2.66)	4.07
VIII	399,645	405,931	384,652	1.57	(5.24)	(1.83)
IX	376,457	379,887	410,239	0.91	7.99	4.45
X	287,558	309,552	308,004	7.65	(0.50)	3.57
XI	409,849	432,454	417,986	5.52	(3.35)	1.08
XII	441,057	491,112	489,851	11.35	(0.26)	5.55
NCR	2,817,816	2,684,760	2,757,859	(4.72)	2.72	(1.00)
C.A.R.	168,382	183,258	196,446	8.83	7.20	8.02
CARAGA	223,302	251,055	253,143	12.43	0.83	6.63
TOTAL	11,630,141	11,857,064	12,016,316	1.95	1.34	1.65

Source: Land Transportation Office (2014).

A paper presented by Clean Air Asia highlighted that “transport planning model adopted by many countries, including the Philippines, prioritized the movement of cars and other motorized vehicles to facilitate the growing demand for mobility of passengers and goods” (Fabian, 2009). This approach has led to the development of more roads and highways, resulting in the preference for private motorized travel (Fabian, 2009).

Meanwhile, the Integrated Environmental Strategies Project in the Philippines (where this author became a part of) was implemented in 2003. IES Philippines aimed to provide policymakers and other stakeholders with quantified data on the health, environmental, and economic impacts of selected integrated measures in the transportation sector and to build support and capacity for integrated policy analysis (Subida, et al., 2004).

Table 6. Motor vehicle registration by type

Date of Preparation: 23 January 2014							
MV TYPE	MODE OF REG.	2011	2012	2013	%INC.'12/'11	%INC.'13/'12	AVE.% INC.
CARS	NEW	61,743	70,344	73,651	13.93	4.70	9.32
	RENEWAL	766,844	781,911	794,497	1.96	1.61	1.79
	Sub-Total	828,587	852,255	868,148	2.86	1.86	2.36
UV	NEW	96,102	104,689	113,872	8.94	8.77	8.85
	RENEWAL	1,652,300	1,666,621	1,680,700	0.87	0.84	0.86
	Sub-Total	1,748,402	1,771,310	1,794,572	1.31	1.31	1.31
SUV	NEW	39,999	42,165	46,535	5.42	10.36	7.89
	RENEWAL	244,100	268,356	299,861	9.94	11.74	10.84
	Sub-Total	284,099	310,521	346,396	9.30	11.55	10.43
TRUCK	NEW	20,643	19,834	23,702	(3.92)	19.50	7.79
	RENEWAL	308,742	321,738	334,743	4.21	4.04	4.13
	Sub-Total	329,385	341,572	358,445	3.70	4.94	4.32
BUSES	NEW	3,474	1,930	2,946	(44.44)	52.64	4.10
	RENEWAL	31,004	31,656	28,719	2.10	(9.28)	(3.59)
	Sub-Total	34,478	33,586	31,665	(2.59)	(5.72)	(4.15)
MC/TC	NEW	1,052,863	1,046,228	1,140,329	(0.63)	8.99	4.18
	RENEWAL	2,828,597	3,070,462	3,110,338	8.55	1.30	4.92
	Sub-Total	3,881,460	4,116,690	4,250,667	6.06	3.25	4.66
TRAILER	NEW	3,071	4,378	4,765	42.56	8.84	25.70
	RENEWAL	29,460	33,081	35,380	12.29	6.95	9.62
	Sub-Total	32,531	37,459	40,145	15.15	7.17	11.16
SUB-TOTAL	NEW	1,277,895	1,289,568	1,405,800	0.91	9.01	4.96
	RENEWAL	5,861,047	6,173,825	6,284,238	5.34	1.79	3.56
TOTAL		7,138,942	7,463,393	7,690,038	4.54	3.04	3.79

Source: Land Transportation Office (2014).

Together with stakeholders in Metro Manila, the project identified integrated air quality/greenhouse gas mitigation measures in the transportation sector to determine which policies can achieve the most significant local and global benefits. The measures were selected based on their potential for air quality improvement and GHG mitigation and the likelihood of implementation (e.g., strong political acceptability).

The team evaluated the impacts of these alternative measures, as well as of a "business as usual" scenario for air quality using the ISC-3 air dispersion model, public health using the APHEBA model, and GHG emissions. An economic valuation of the public health impact of the different measures was also undertaken. Table 7 shows the scenarios considered in the IES Project with remarks on their status.

Table 7. Policy scenarios considered in the IES Philippines Project

	Policy Scenarios	Remarks/Status
i.	Transportation Demand Management through license plate scheme (TDM)	Policy ongoing (first implemented in 1995); involved <i>Unified Vehicular Volume Reduction Program</i> , commonly called “number coding” or “color coding”; restricts the types of vehicles that can use major public roads based on the final digit of the vehicle's license plates.
ii.	Construction of rail-based mass transit system	Ongoing – three “light rail” systems fully operational in Metro Manila (MM) although needing rehabilitation and additional capacity; plans underway for expansion and new lines. Old commuter rail system (under Phil. National Railways) used to link MM to selected Luzon provinces (such as the Bicol region), however, also needing rehabilitation/modernization; currently on limited run in selected cities in MM (See <a href="http://www.pnr.gov.ph/">http://www.pnr.gov.ph/</a> for more details.)
iii.	Construction of Bikeways	So far, only one city (Marikina) is fully implementing it. Other cities (Pasig, Quezon, and Antipolo cities in MM, Davao in Mindanao) implementing on limited basis. Large campuses like UP and Ateneo in Quezon City have devoted bikers and joggers lanes. Portions of EDSA with bike lanes but heavy traffic and poor air quality are clear deterrents. To get a copy of the document, <i>Marikina Bikeways: Bicycle Planning and Evaluation Toolkit</i> , go to <a href="http://ncts.upd.edu.ph/old/estnow/docs/Toolkits/bicycle_toolkit_v3.doc">http://ncts.upd.edu.ph/old/estnow/docs/Toolkits/bicycle_toolkit_v3.doc</a>
iv.	Implementation of the Motor Vehicle Inspection System (MVIS)	Emission testing required in annual vehicle registration; random checking in highways by traffic enforces although not seriously implemented in recent years.
v.	Introduction of the Compressed Natural Gas buses (CNG)	Natural Gas Vehicle Program for Public Transport ongoing but still on limited run (as of 2012, 37 CNG buses hold a franchise; 27 additional CNG buses for franchise to operate); among key issues is the availability of refueling stations.
vi.	Introduction of <i>Cocodiesel</i> for diesel-fuelled vehicles particularly jeepneys (CME)	Biofuels Law enacted in January 2007; increase to the mandated biodiesel blend from 2% to 5% in 2015; tests are ongoing. (See <a href="https://www.doe.gov.ph/energy-resources-alternative-fuels/biofuels/biodiesel/322-coconut-methyl-ester-cme">https://www.doe.gov.ph/energy-resources-alternative-fuels/biofuels/biodiesel/322-coconut-methyl-ester-cme</a> for more info.)
vii.	Two stroke tricycles switching to four-stroke engines	Importation of two-stroke motorcycles banned already; owners of old 2-stroke engines are encouraged to retrofit/replace, with few LGUs offering soft loans (e.g., San Fernando in Pampanga and Mandaluyong City in MM).
viii.	Improvement of vehicles by the Use of Diesel Traps	Implemented but on limited basis. No clear data available as of this time. An ADB study (2003) discusses a diesel retrofit program. Go to <a href="http://www.rff.org/rff/Documents/RFF-DP-03-30.pdf">http://www.rff.org/rff/Documents/RFF-DP-03-30.pdf</a> to get a copy.
ix.	Combo 1 – combination of policies: all policies except railways and switching of two stroke to four stroke tricycles	See notes above.
x.	Combo 2 – all policies except railways	See notes above.
xi.	Combo 3 – all policies including railways	See notes above.

Source: Adapted from IES Philippines Project Report (2003). Remarks had been added by the author.

Three single policies had shown to have the advantage of leading to more health and economic benefits, based on the assumptions made in the scenario development. These are (i) the implementation of the maintenance of vehicle and inspection system, (ii) switching from four-

stroke to two stroke tricycles, and (ii) use of the metro railways. These three policies had been proposed by the team to decision makers particularly the Department of Transportation and Communication and the Metro Manila Development Authority. As expected, the modeling showed that the combinations of policies will likely result to significant health and economic and reduction of CO<sub>2</sub>. Therefore, these combinations of policies should also be implemented (Subida, et al., 2003).

While this study has focused in Metro Manila only, the results offer strong bases for future planning, particularly in the light of low carbon development. Clearly, the population and urbanization are growing at an unprecedented rate while spaces in roads and public vehicles are shrinking.

### **Considerations in planning for LCD in the transportation sector**

The Philippines is a signatory to the Nagoya Statement. The Nagoya Statement was signed at the International Conference on Environmentally Sustainable Transport (EST) in the Asian Region in 2003.

Meanwhile, the *Manila Policy Dialogue on Environment and Transportation* was conducted in 2004. Here, stakeholders identified the need for strategic planning on EST with both the long-term vision and short to long-term actions at the regional, national and local levels.



Recent estimates show that almost half a million people ride the MRT every day. Ironically, the line's capacity is up to 350,000 only. [Photo credit: Interaksyon.com]

However, the country has yet to develop and realize an integrated national framework in achieving sustainable transportation. Similar to the needs in the other two sectors discussed in this paper, there is also a need to develop and strengthen capacities particularly of concerned agencies and stakeholders. Efforts are also hampered by lack of a strong social marketing component.

A low carbon development plan in the transportation sector should seriously prioritize decongestion issues (particularly in Metro Manila's main thoroughfares such as EDSA), provision of better, more efficient, and affordable public transportation systems, strengthen control measures (such as those related to emissions), and encourage non-motorized modes of travel. However, actions should be coherent and integrated. For example, it is unrealistic to expect Metro Manila residents to use light rail way systems knowing that riding the trains means agonizing over exceedingly long lines—sometimes extending to 300 meters during peak hours—and having to push and shove just to hop in and find an available space. In the same breathe, it may be more costly for the economy to encourage people to use bicycles to work when the air quality is poor (e.g., higher public health costs due to increased cases of respiratory diseases).



### 3. Household sector

There are about 21 million households in the Philippines. Average annual income per family is PhP 206,000 (about US\$ 4,325) while in Metro Manila, it is ₱356,000 (about US\$ 7,474).

Poverty incidence among Filipinos registered at 24.9% (PSA, 2013). Table 8 shows the latest poverty-related data from the Philippine Statistics Authority.

Table 8. First Semester Per Capita Thresholds and Incidences: 2006, 2009, 2012, and 2013

Statistics	1st Semester Estimate				Increase/Decrease			Coefficient of Variation			
	2006 <sup>a/</sup>	2009 <sup>a/</sup>	2012 <sup>a/</sup>	2013 <sup>b/</sup>	1st Sem 06-09	1st Sem 09-12	1st Sem 12-13	1st Sem 2006 <sup>a/</sup>	1st Sem 2009 <sup>a/</sup>	1st Sem 2012 <sup>a/</sup>	1st Sem 2013 <sup>b/</sup>
Per Capita Food Threshold (PhP)	4,673	5,883	6,549	6,708	25.9	11.3	2.4				
Subsistence Incidence (%)											
Families	10.8	10.0	10.0	7.7	(0.8)	(0.0)	(2.3)	2.8	3.6	4.4	6.4
Population	14.2	13.3	13.4	10.7	(0.9)	0.1	(2.7)	2.7	3.5	4.2	6.0
Per Capita Poverty Threshold (PhP)	6,703	8,448	9,385	9,626	26.0	11.1	2.6				
Poverty Incidence (%)											
Families	23.4	22.9	22.3	19.1	(0.5)	(0.6)	(3.2)	1.9	2.6	3.2	4.3
Population	28.8	28.6	27.9	24.9	(0.2)	(0.7)	(3.0)	1.8	2.5	3.0	3.9

Source: Philippine Statistics Authority.

Notes:

a/ The 2006, 2009 and 2012 estimates are based on the first visit of the Family Income and Expenditure Survey (FIES), which used four replicates of the 2003 Master Sample or approximately 51,000 sample. These estimates were released last 23 April 2013. b/ The 2013 poverty estimates are based on the 2013 Annual Poverty Indicator Survey (APIS) conducted in July 2013, which adopted the income module of the FIES (with some modifications in the section containing the list of wage and salary workers in the family), and used one replicate of the 2003 Master Sample or approximately 12,000 sample. c/ The corresponding standard error and confidence intervals of the subsistence and poverty incidence among families and population are provided in Table 3.

Meanwhile, Table 9 shows the government's estimates of average monthly thresholds for a family of five for the years 2006, 2009, 2012, and 2013.

Table 9. Average Monthly Thresholds for a Family of Five: 2006, 2009, 2012 and 2013

Statistics	Average Monthly Estimate <sup>a</sup>				Increase/Decrease		
	2006	2009	2012	2013	06-09	09-12	12-13
Food Threshold for a Family of Five (PhP)	3,894	4,903	5,458	5,590	25.9	11.3	2.4
Poverty Threshold for a Family of Five (PhP)	5,586	7,040	7,821	8,022	26.0	11.1	2.6

Source: Philippine Statistics Authority

Notes:

a/ Based on price data in the first semesters of 2006, 2009, 2012 and 2013.

Considering that electricity in the Philippines is expensive, much needs to be done in the power sector as well. Just to give a simple illustration from the above data—an average family of five members needs to have a disposable income of PhP 5,586 per month in order to live decently. However, using the average cost of electricity of P11.50/kWh (Meralco, 2014) for a low-consumption household—typically with usage of 200 kWh or below per month—we will come up with a monthly electricity bill of PhP 1,380 for a 120-kWh consumption. This is already one-fourth of a family's disposable income!

This issue will be discussed further in Chapter 4 further a simple analysis of the electricity consumption of seven families.



# CHAPTER FOUR



## Low carbon development at the Household Level: Is Solar Energy Viable?

### 1. LCD at the household level: What is in it for us?

This chapter looks primarily at the use of clean energy as a form of low carbon intervention. It is considered as a good example because it can contribute to greenhouse gas mitigation, is practical, can be done in the household level, and supported by legislation<sup>3</sup> (with the enactment of RA 9513 or the Renewable Energy Law of 2008).

As mentioned earlier, Filipinos are finding the cost of electricity in the Philippines too expensive. Tiglao (2014) reported that “based on Meralco’s tariffs (using residential rates of 200 kilowatt hours per month consumption) which averaged 24 US cents per kilowatt hour in 2013, the price we pay for our electricity, believe it or not, is the fifth highest in the world.” He further elaborated that “if our electricity prices were the criterion for membership, we are in the league of the richest countries in Europe, and our rates are even a bit higher than Japan (Kansai region), 24 US cents, and Singapore, 23 cents.”



The future belongs to our children; let us leave them a greener and healthier environment. Photo credit: Reynaldo C. Mondez

There is a strong clamor for lower electricity rates and this can be a very effective intervention where people can feel, on the gut level, the benefit of being more responsible ecologically. Making renewable energy more accessible and understood may ultimately lead to wider household-level application. This will address the question, “what is in it for me?”

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<sup>3</sup>Note, however, that the RE Law is still a relatively new law so certain assumptions must still be done (e.g., performance of household on-grid systems).

However, renewable energy—as with climate change and low carbon development—must be demystified. Ownership of decisions begins with knowledge and acceptance. Renewable energy will continue to be just among those misunderstood concepts, away from personal priorities, as long as it is never made familiar and accessible.

This chapter will not be very exhaustive due to time limitations. What it hopes to do is develop a simple analysis on the viability of the shift to solar energy at the household level in the Philippines (relying on a small set of data<sup>4</sup>, particularly from seven selected households in the National Capital Region). A quick literature review (online sources) reveals that there are estimates done already but most if not all are done by solar panel suppliers and do not give the complete picture (e.g., actual costs that consider current interest rates of loans from banks, etc.)

The Energy Forecasting Framework and Emissions Consensus (EFFECT) Tool will be used in forecasting GHG emissions later on, based on a couple of scenarios where households (on a national level) will shift to solar energy. As there is very limited timeframe, it is hoped that the initial analysis here will ultimately lead to more exhaustive study in the future. The author may also consider this or a related topic for the fulfillment of a Special Problem requirement in her master's course work<sup>5</sup> at the University of the Philippines Open University.

## 2.Up-close and Personal: Understanding the Electric Bills of Seven Households

To derive a simple set of data, the author conducted an informal survey of seven households who are Metro Manila residents. Note, however, that due to time limitation, the six households included here are typically in the middle and upper-middle income groups with disposable monthly income of more than PhP 45,000 (roughly USD 914). However, the 7<sup>th</sup> household (coded “Gray”) is from a lower-income bracket and can represent typical consumption in this income group. The second head of the family of Household Gray is actually the domestic staff (on live-out arrangement) of Household Blue. Code names had been used to protect their privacy.

Table 10.Profiles of seven participating households

Household names (coded)	No. of persons in the HH	Total consumption (in kWh)	Total cost of consumption (April 2014 Meralco Bill) (in PhP & USD)	Notes about the households
1. Red	7	409	PhP 5,277.82 (USD 120.55)	The family, based in Quezon City, lives in a 1-storey bungalow (detached) with a small garden. This family has the highest consumption (in terms of total kWh) because it also has the highest number of family members (6 are adults while 1 is a young adult).
2. Blue	4	374	PhP 4,500.00 (USD 102.79)	The family lives in a 2-storey house (attached type, similar to a duplex or apartment/townhouse rows) in Quezon

<sup>4</sup> The author used the actual electricity bills of seven households in her personal networks, current rate of interest for financing through a bank loan, and quotation from a Philippine suppliers or solar panels and systems.

<sup>5</sup> The author is currently pursuing a Master of Environment and Natural Resources Management degree.

				City. It is the next highest electricity-consuming family (in terms of total kWh). The head of the family is a professor/teacher while the wife manages the family-owned printing/publication business.
3. Yellow	3	339	PhP 4,141.00 (USD 94.59)	This family lives in a condominium unit in Ortigas area (a business center). This is the highest electricity-consuming family in terms of consumption per person. (See Table 11). The head of the family is an entrepreneur and PR and media consultant.
4 Orange	2	214	PhP 2,552.01 (USD 58.29)	The couple lives in a small flat in Quezon City. The relatively high consumption (per person basis) may be attributed to the household's use of electric induction stove instead of an LPG stove, which is the more common practice in the Philippines. (All other households in this small survey use LPG stoves).
5. Green	5	181	PhP 2,008.82 (USD 25.24)	Also based in Quezon City, this is considered the most energy-efficient household. The low bill can be partly explained by the design of the house, which followed sound ecological principles. Unlike the other households, it also has no air-conditioning unit. The author had taken note of the house, which allows natural ventilation and ample use of ambient light.
6. Pink	2	103	PhP 1,105.15 (USD 25.24)	The couple lives in Parañaque City and has a second home in the outskirts of MM. This billing is for their house in Parañaque. This partly explains the low consumption.
7. Gray	4	87	PhP 800.00 (USD 18.27)	This household is typical of families in the lower-income group. Outside of owning a few light bulbs, it has 2 electric fans and 1 TV only. It does not own a refrigerator. The second head of the family of this HH is the domestic staff of Household Blue. She is married to a taxi driver. They have 1 child and 1 niece/nephew living with them.

Table 11 shows a more detailed analysis of the seven households' electricity consumption. It shows each household's average cost of consumption per kWh (Column "E"), consumption per person in kWh (Column "F"), average cost per person (Column "G"), total household annual consumption in kWh (Column "H"), total annual GHG emissions in kg (Column "I"), and average GHG emission per person (Column "J").

Table 11. Household profile by electricity consumption

Household name	No. of persons in the HH	Total monthly consumption (in kWh)	Total cost of monthly consumption (in PhP & USD)	Ave. cost of monthly consumption per kWh (in PhP & USD) [D/C]	Ave. monthly consumption per person (in kWh) [C/B]	Ave. monthly cost per person (in PhP) [E x F]	Total HH Annual consumption (in kWh) [C x 12]	Total HH GHG Emissions* (in kg/year)	Ave. GHG emissions per person (in kg/year) [I/B]
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
1. Red	7	409	PhP 5,277.82 (USD 120.55)	PhP 12.90 (USD .29.)	58.43	753.75	4,908	2,960.51	422.93
2. Blue	4	374	PhP 4,500.00 (USD 102.79)	PhP 12.03 (USD.27)	93.50	1,124.80	4,488	2,707.16	676.79
3. Yellow	3	339	PhP 4,141.00 (USD 94.59)	PhP 12.22 (USD.28)	113	1,380.86	4,068	2,453.82	817.94
4 Orange	2	214	PhP 2,552.01 (USD 58.29)	PhP 11.93 (USD.27)	107.00	1,276.51	2,568	1,549.02	774.51
5. Green	5	181	PhP 2,008.82 (USD 45.88)	PhP11.10 (USD.25)	36.20	401.82	2,172	1,310.15	262.03
6. Pink	2	103	PhP 1,105.15 (USD 25.24)	PhP 10.73 (USD.24)	51.50	552.59	1,236	745.55	372.77
7. Gray	4	87	PhP 800.00 (USD 18.27)	PhP 9.19 (USD .21)	21.75	199.88	1,044	629.74	157.43

\*Total GHG emissions are estimated by multiplying the annual emissions to .6032 as **emission factor** for the Philippines (Kuriyama, 2014). Forex rate \$ 1 = PhP 43.78

### 3. Is solar energy at the household level viable?

From Tables 10 and 11 and from using data derived from two other sources (average interest rate and a quotation from a solar system distributor),<sup>6</sup> the author tried to determine the viability of converting to solar-powered system at 100% reliance (on-grid).

Based on the calculations, these seven families may be able to convert to solar power at an investment of roughly PhP 66,200 (about USD1,512.11) for a household system with a requirement of 87 kWh to PhP 316,800 (about USD 7,236.18) for a household system with a requirement of 409 kWh. Assuming that the conversion will be made possible through bank loans with loan tenor of 10 years, the families in this study will reach the “recovery point” (vis-à-vis their current costs of electricity and cost of investment) beginning from the last quarter of the 7th to the middle of the 11<sup>th</sup> years.

In simple terms, this means that the families will begin enjoying “free electricity” beginning from the 8<sup>th</sup> to 11<sup>th</sup> years and onwards. Assuming that the solar power systems installed have a life span of 25 years,<sup>7</sup> the families will be enjoying “free electricity” for 14 to 17 years, worth about PhP 134,400 (USD 3,069.89)<sup>8</sup> to about 1,076,675 (about USD 24,592.85)<sup>9</sup>. These calculations did not

<sup>6</sup> The interest rate was derived from Central Bank (2014) while the quotation of PhP 132/watt was provided by a solar system vendor based in the Philippines.

<sup>7</sup> Based on industry estimates. The rated power output of solar panels typically degrades at about 0.5%/year. The majority of manufacturers offer the 25-year standard solar panel warranty, which means that power output should not be less than 80% of rated power after 25 years (Maehlum, 2014). More details and explanation are in the Maehlum article. See references for the source URL.

<sup>8</sup> Based on data for Household Gray.

consider the possibility of earning rebates by being connected to the grid. They also did not consider the yearly degradation of the solar systems and whether the families will have higher level of consumption in the future. In the case of higher consumption (i.e., beyond their current level of consumption), they cannot expect income/savings from rebates by being connected to the grid. Nevertheless, installing a solar system is still a viable project in terms of reducing family expenditure for electricity and being more ecologically-responsible. At the worst case scenario, they will enjoy “free electricity” for a significant amount of time, say, 12 years.

See Table 12 for the results of the calculations.

Table 12. Household profiles showing costs of converting to solar power systems

Household name	No. of persons in the HH	Total consumption (in kWh)	Total annual cost of consumption (non-solar energy) (in PhP & USD)	Est. cost of solar power system (in PhP & USD)	Cost of solar system (incl. loan interests)	Ave. monthly amortization* (in PhP & USD/month)	Period of recovery vis-à-vis loan amount & current costs* [F/D]
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
1. Red	7	409	63,333.84 (USD1,446.64)	316,800.00 (USD 7,236.18)	481,793.21 (USD 11,004.87)	4,014.94 (USD91.71)	7.75 years
2. Blue	4	374	54,000.00 (USD 1,233.44)	277,200.00 (USD 6,331.66)	421,569.06 (USD 9,629.26)	3,513.08 (USD80.24)	7.9 years
3. Yellow	3	339	49,692.00 (USD 1,135.04)	264,000.00 (USD6,030.15)	401,494.34 (USD9,170.72)	3,345.79 (USD76.42)	8.1 year
4 Orange	2	214	30,624.12 (USD 699.50)	158,000.00 (USD3,608.95)	240,288.28 (USD5,488.54)	2,002.40 (USD45.74)	7.85 years
5. Green	5	181	24,105.84 (USD 550.61)	145,200.00 (USD 3,316.58)	220,517.73 (USD5,036.95)	1,837.65 (USD41.97)	9.2 years
6. Pink	2	103	13,261.80 (USD 302.92)	79,200.00 (USD 1,809.05)	120,448.30 (USD2,751.22)	1,003.74 (USD22.93)	9.1 years
7. Gray	4	87	9,600.00 (USD 219.28)	66,200.00 (USD1,512.11)	100,677.75 (USD2,299.63)	838.98 (USD19.16)	10.5 years

\*The point when households have already recovered their investment vis-à-vis cost of electricity based on current costs (non-solar systems). Notes: The values in Column F did not put costs of taxes and battery backup systems into consideration; the income/savings accruing from connecting to the grid (on-grid system) is also not considered. The estimates are based on 6 hours of insolated sunshine per day. Assumptions: Bank interest rate of 7.5% interest per annum, under a 10-year loan tenor; estimated cost per watt is PhP 132.00 or \$ 3.01; forex \$ 1 = PhP 43.78. Interest rate source: Security Bank Corp rate (high long-term) as published by Central Bank of the Philippines (2014, April) at <http://www.bsp.gov.ph/statistics/keystat/intrates.htm>

To reiterate, the process of calculation done here is quite simplistic. Other factors and assumptions must be considered in the future. Factors such as reversal of billing or rebates—which may be considered as savings or income if the household systems are connected to the grid—must be

<sup>9</sup> Based on data for Household Red.

considered in the future. For example, Section 7 of the RE law's Implementing Rules and Regulations have provisions for a net metering system, a system that allows a generator of electricity to have two-way metering scheme where he will be charged for the electricity he consumes and credited for the energy he produces and eventually contributes to the grid. (See *Climate Change and Clean Energy Project* in the references for the links to the RE law and its IRR.)

Over-all, the conversion to solar energy at the household level is very viable, even for low-income families. However, the government and the private sector should continue to work together to ensure the system's affordability and availability of better financing, for example, in the form of low-interest loan packages and subsidized/socialized arrangements for the lower income group. The interest rate used in this small case study is **7.5%** based on a commercial bank's long-term rate (with collateral). The market should appreciate that households can be motivated to shift to more ecologically-friendly lifestyle if there are enough drivers and incentives. The government and the market should adequately provide such mechanisms for wider public engagement and positive action.

# CHAPTER FIVE



## Moving Forward

As mentioned at the start of this paper, low carbon development—as among the approaches for addressing and dealing with climate change—is not something ‘close to the hearts’ of the people. It sounds very technical. One can try approaching a layman out on the street and ask him to define “low carbon development” and he will most likely stare at you blankly or timidly offer an answer such as “Oh...it must be something related to carbon!”

How can policy makers and development managers ensure that the concept is embraced by all, and thereby, elicit strong cooperation and positive action? This brief paper—submitted as a requirement for a timely e-course—may contribute to our life-long analysis of climate change, more specifically, on the challenge of encouraging more authentic public participation in the discourses, policy work, and programmatic interventions.

### Low carbon development – what is in it for me?

How can people take climate change and low carbon development (LCD) more personally and in the process, engage in public discourses and more positive action? How can people actually see it as beneficial to them on a more personal level? Basic things must be considered first, among other things:

- people prioritize their economic security and for as long as environment (and climate change) is seen as an entirely separate thing, it will be tough convincing them to address it or relate it with their day-to-day decision making;
- climate change and LCD ‘compete’ with more urgent, dramatic, and emotional issues of our times—even if climate change actually makes living in a tropical country more risky and dangerous (one cannot think of solar panels when he is hungry!);
- people tend to think more of the “here and now”, therefore, short-term benefits should be considered as an important dimension in the development of long-term plans; and



Demystifying renewable energy as a first step in wider application of a low carbon intervention.  
Photo credit: Interaksyon.com



- a system of reward and incentives must be practiced at the household and community levels so everyone feels responsible, developing or increasing a form of social pact and solidarity.

Therefore, any intervention must consider and respect individual desires and aspirations, which ultimately drive people toward decision-making and concrete action. For example, a family will not be motivated to shift to a more environment-friendly lifestyle such as the use of cleaner energy if it considers the shift as costly, time-consuming, bureaucracy-laden, and technically difficult.

## **Proposed Outline for a Future LCD Plan**

The discussions in this paper will hopefully serve as inputs to the development of a carbon development plan for the Philippines, with particular focus on the power consumption in the household level (assuming that a full-blown LCD plan is already complete or currently being done by the Philippine government). The author also considers this as a possible research topic in her graduate course work. Should this plan push through, the future paper (for an LCD plan in the power sector focusing on households) may be guided by the following outline:

1. Overview of the Philippine energy sector
2. The policy environment: focus on the power sector
3. Understanding electricity consumption at the household level
4. Baseline and alternative scenarios (focus on solar energy at the household level)
5. Viability of the alternative scenarios
6. Issues/challenges in the application of solar energy use in household level
7. Recommendations

The Renewable Energy Act is certainly an important impetus in pushing for low carbon development in the Philippines, particularly in the power sector. As in any social development intervention, it is always necessary to put a strong political framework in place. The RE law answers this need. However, the market and stakeholders should be equipped and empowered—and the empowerment process should be across the board. The policymakers, regulators, investors, distributors, and consumers should be willing and able to participate, act, and enjoy the rewards of having cheaper electricity, cleaner air, and sustainable environment. The supply and demand sides must be thoroughly analyzed and supported. Furthermore, research and development should always support policy and programmatic interventions as it is only through scientific studies can we fully maximize the potential of our resources and technologies.

It is hoped that this paper can contribute to advocacy and social marketing efforts and stronger policy review and implementation. It is also hoped that this will lead to more in-depth studies and analysis in the future.

After all, any law's relevance should be measured in how well it protects the welfare of individuals and communities and such a protection takes the reality—that everything begins in the personal level—into consideration.

Any societal transformation requires a personal commitment.

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## About the Author

**Mary Anne Velas-Suarin** carries with her a rich social development and environmental management experience spanning over fifteen years in both the public and private sectors. She graduated from the University of the Philippines with a degree in Development Studies and began her graduate course work in Master in Environmental Management at the Ateneo de Manila University. She has gone back to UP (through UPOU), where she is continuing her graduate course work in Master of Environment and Natural Resources Management. There, she also completed a non-formal course, *Responding to Climate Risks in Agriculture and Natural Resources Management*. This brief paper is a submission for the e-learning course, *Low Carbon Development - Integrated Course* of the World Bank eInstitute.



Mary Anne is currently doing independent consulting work, working with projects of the Asian Development Bank from 2011 to 2013. She has authored and co-authored several books, the latest of which are guidebooks (published by ADB in 2013) on public-private partnerships in health and guidebooks on sustainable sanitation (published by the Department of Health and World Bank in 2010). In the past, Mei provided technical support to Philippine legislators and cabinet members, including the Secretaries of the Department of Environment and Natural Resources and Department of Health. Mei is currently doing independent work for an energy and utilities consulting firm based in the US. She writes blogs and articles and is into photography.

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