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Tracking Clean Energy Progress in ASEAN Member States and Analysis of Implementation Deficits

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Abstract: *The extreme prevalence of energy poverty in several Member States of Association of Southeast Asian Nations (ASEAN) calls for urgent action. This paper shows how clean energy development can be made inclusive by involving low-income households as producers, employees, and business owners. From this perspective, it also analyses how ASEAN economies are stepping up clean energy ambitions and the implementation deficits. One imperative is (i) clean energy with positive externalities that are not factored in either the production or purchasing decisions of consumers. (ii) If non-clean energy companies or products generate negative externalities but no tax or disincentive is levied, then governments may either tax these firms or give incentives to clean energy producers. It concludes that ASEAN Member States need to link the clean energy paradigm and inclusive development policies as part of the Environmental Fiscal Reform to strengthen the foundations for the ASEAN Socio-Cultural Community.*

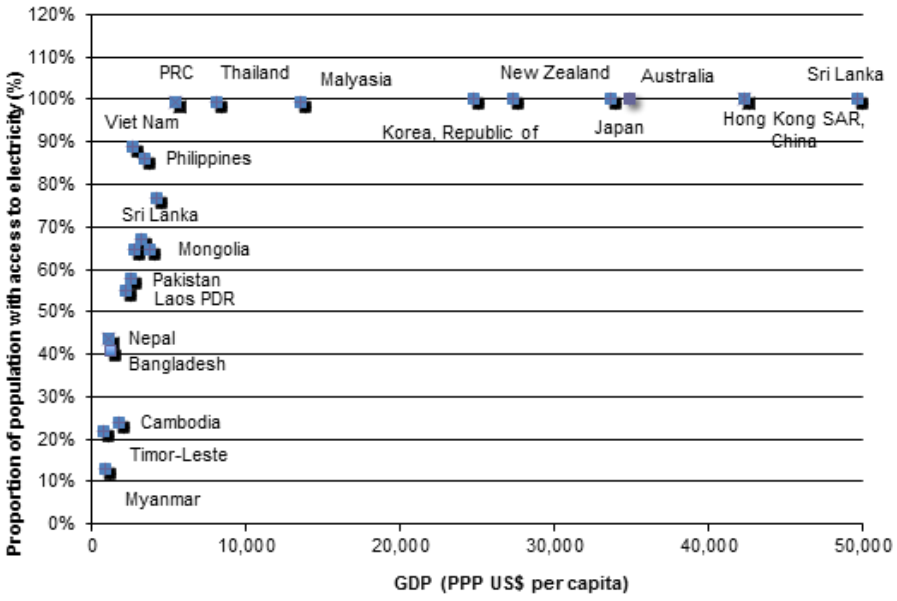
Keywords: Rural development; employment creation; energy poverty; inclusive growth; ASEAN

JEL Classification: Q 34, O13, O23

1. Redefining Economic Growth, Energy and Environmental Concerns, and Poverty Reduction

The impact of economic growth upon the poor in Association of Southeast Asian Nations (ASEAN) countries is a complex and contentious issue. With households as the unit of observation, raising their average income is clearly of critical importance where rapid economic growth has become a priority. In the last three decades, the pursuit of growth has been the single most important policy goal of any ASEAN member state (AMS). The ASEAN economy is almost five times its size since three decades ago. If it continues to grow at the same rate, the economy will be 80 times bigger by the year 2050 (ADBI, 2013). It is totally at odds with the knowledge of a finite energy resource base on which ASEAN economies depend on for survival (Table 1). Today, many AMS are faced with steadily rising commodity prices, the degradation of forests, the imminent end of an era of stable oil supply, and the momentous challenge of stabilising concentrations of carbon in the atmosphere (Figure 1).

Figure 1: Trends in Carbon Dioxide Emissions and GDP (PPP US$ per capita) in Selected ASEAN and Non-ASEAN Countries



Notes: GDP = gross domestic product; PPP = purchasing power parity, PRC = People's Republic of China.
Sources: World Bank, World Development Indicators; OECD/IEA, Electricity Access Database, World Energy Outlook.

For the most part of the last two decades, economic growth avoided addressing the stark reality of issues related to the quality of growth. The myth of strong growth to lift the masses to prosperity has failed us. It has failed a billion people who live on less than US$2 a day. It has failed to provide 40 million people with access to clean and green electricity.

A rebalancing is urgently needed as conventional ideas of economic growth alone are not sufficient to achieve prosperity. Economic growth needs to be sustainable, sustained, and inclusive. When growth is unsustainable, a region is enjoying current consumption of resources such as energy at the expense of future generations. The distributional patterns of growth also have deep sustainability implications, especially where inequality levels are already quite high. Various factors influence the magnitude of growth elasticity of poverty, including initial inequality, the distributional pattern of growth, the composition of public expenditure, the role of private sector, amongst others. Governments can intervene in each sector to reduce poverty, and in the ASEAN context, these interventions will lead to a successful economic integration.

Table 1: GDP per Capita, Electricity Consumption, and Carbon Dioxide (CO_2) Emissions in ASEAN Countries

Country	GDP per capita (Current US$) (I)	GNI per capita , PPP (current International $) (II)	TPES/Poplation (toe /capita) (III)	Electricity consumption/ Population kwh/capita) (IV)	CO_2 emissions/ Population (ton / capita) (V)
Australia	48,499	35,740	6.05	11,174	18.48
Cambodia	710	1,870	0.36	112	0.31
China	3,422	6,240	1.6	2,471	4.92
India	1,065	3,020	0.54	566	1.25
Indonesia	2,246	3,860	0.87	589	1.69
Japan	38,268	34,850	3.88	8,072	9.02
Lao PDR	882	2,050			
Malaysia	8,187	13,770	2.7	3,493	6.7
Myanmar			0.32	98	0.24
New Zealand	27,045	26,430	3.93	9,413	7.74
Philippines	1,854	3,520	0.45	588	0.8
Singapore	39,950	51,680	3.83	8,186	9.16
Korea, Republic of	19,162	27,080	4.67	8,853	10.31
Thailand	4,043	7,780	1.59	2,079	3.41
Viet Nam	1,051	2,700	0.69	799	1.19

Notes: GDP = gross domestic product; TPES = total primary energy supply.
Sources: I, II - http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD/countries.
III, IV, V - Key World Energy Statistics 2010, IEA.

1.1. Energy Access and Developmental Constraints of Low-Income Households

The economic pyramid of any nation consists of several tiers. At the global level, 75 to 100 million households constitute Tier 1 composed of middle- and upper-income households from developed countries and a few rich households from developing Asia (Table 2). In the middle of the pyramid are Tiers 2 and 3 composed of low-income households from developed countries and middle-income households from developing economies. Tier 4 consists of about four billion people whose per capita income is very low and not enough to sustain a decent life. This extreme inequality in wealth distribution reinforces the view that low-income households cannot participate constructively in the regional or global economy even though they constitute the majority of population. According to United Nations (UN) projections, the population of low-income households may double because the bulk of population growth occurs in this tier (World Bank, 2007). Most low-income population lives in rural areas or urban slums, do not usually possess assets nor legal titles to their lands, and do not have access to electricity.

Table 2: Tiers of Development in the Economic Pyramid

Population and Gross National Income Per Capita (2009)

Income Group	Population (billion)	GNI per Capita, Atlas Methodology (Current US$)	GDP per Capita, PPP (Constant 2005 International $)
High Income	1.12	38220	32779
Upper Middle Income	1.00	7,471	10,799
Lower Middle Income	3.81	2,298	4,299
Low-income	0.85	503	1,053
World	6.78	8,741	9,514
Middle income	4.81	3375	5652

Notes: GNI = gross national income, GDP = gross domestic product, PPP = purchasing power parity.
Source: http://data.worldbank.org/income-level/NOC, The World Bank.

Table 3: Poverty Distribution in ASEAN

Country	Population in 2012 (in thousands)	Percent of population below the 1.25 PPP poverty line	Number of population below the 1.25 PPP poverty line
Brunei Darussalam	400	-	0
Cambodia	14,741	26.1 (2009)	3676 (2009)
Indonesia	245,425	12 (2012)	29451 (2012)
Lao PDR	6,514	24 (2010)	1501 92010)
Malaysia	29,518	3.8 (2010)	1086 (2010)
Mynamar	60,976	23.6 (2011)	14250 (2011)
Philippines	97,594	25.2 (2012)	24593 (2012)
Singapore	5,312	-	0
Thailand	67,911	9.0 (2008)	5983 (2008)
Viet Nam	88,773	11.1 (2012)	9750 (2012)
Total	**617,164**		

Source: AMSs submission for ASEAN Statistical Year Book 2013

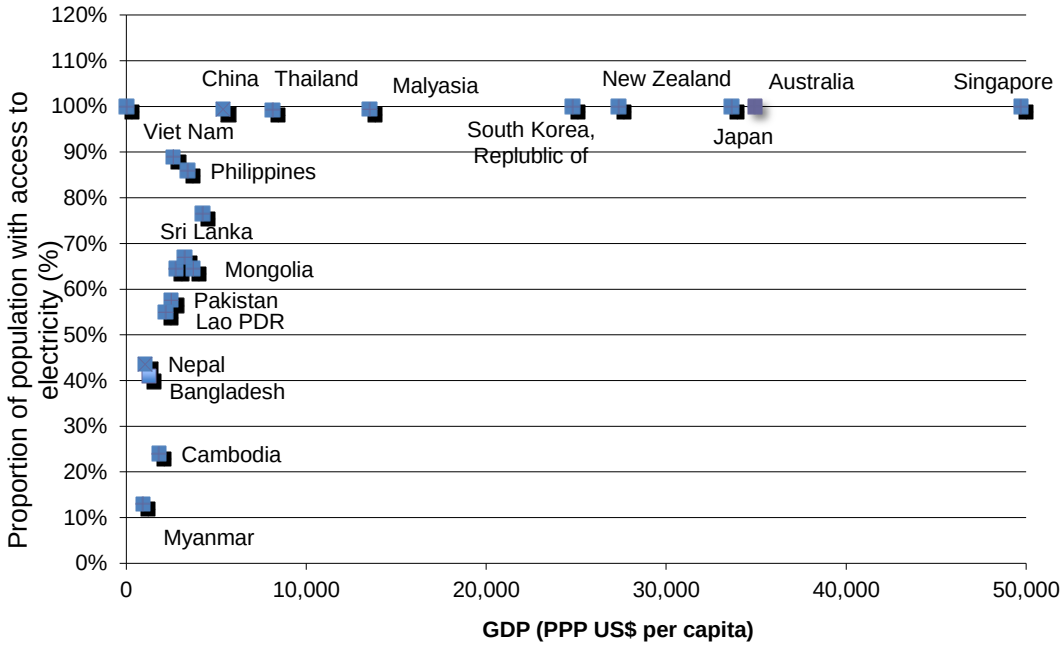
Country	No. of poor in 2010 (million) Source: Wan and Sebastian (2011, Table 5)	Population in 2010 (million) Source: ASEAN Statistical Yearbook 2013	ASEAN-7 Poverty Rate in 2010
Cambodia	8.28	14.52	38.19%
Indonesia	117.43	241.99	
Lao PDR	4.12	6.38	
Malaysia	0.61	29.52	
Philippines	38.42	97.59	
Thailand	6.59	67.91	
Viet Nam	33.33	88.77	
Total	**208.78**	**546.68**	

Note: PPP = purchasing power parity.
Sources: ASEAN Statistical Yearbook, 2013

The distribution of poverty-hit people in ASEAN is presented in Table 3. About 33 percent of 618 million people can be categorised as poor and looking for better economic opportunities. Many studies (Prhalad, 2010; Pokharel, 2003) already demonstrate the link between access to modern forms of energy—and its importance in providing reliable and efficient lighting, heating, and cooking systems—and access to clean water and improved sanitation. As the International Energy Agency (IEA) World Energy Outlook (IEA, 2010) suggests, countries with a large share of people living on an income of less than US$2 per day tend to have low electrification rates, rely mostly on biomass and waste, and have less access to clean water and improved sanitation. As incomes increase, access to electricity improves because governments give priority to electrification over cooking fuels, water, and sanitation. In order to eradicate poverty and allow development to be more inclusive, it is therefore imperative to have access to energy for lighting, mechanical power, cooking, and transport along with improved access to water and sanitation (Figure 2). On the contrary, the number of people relying on biomass and waste as fuel is projected to

increase in the coming decades, raising grave concerns over air pollution generated by households from the use of biomass in inefficient stoves which is expected to result in over a million premature deaths per year. The same IEA study further suggests that in the next 20 years, an investment of US$756 billion or US$36 billion per year will be required at global level to stabilise global warming to 2 C.

Figure 2: Trends in Access to Electricity (%) and GDP (PPP US$ per Capita) in Selected ASEAN and Non-ASEAN Countries



Notes: GDP = gross domestic product, PPP = purchasing power parity, PRC = People's Republic of China.
Source: The World Bank Development Indicators.

In order to deal with these problems, there have been various solutions offered at the macro level in terms of improving access to electrification and at the micro level in terms of spreading more energy efficient technologies to provide lighting and heating services. As the IEA (2010) study suggests, even if rural households are assumed to consume at least 250 kilowatt-hours (kWh) per year and urban households 500 kWh per year, this consumption would require an incremental electricity output of around 950 terawatt-hours (TWh) by the year 2030. Generating this additional electricity output would require a capacity of 250 gigawatt (GW), and various models of supply and distribution would need to be considered including on-grid, mini-grid, and isolated off-grid solutions. Grid expansion will solve the problems more easily in

the urban context but decentralised options will play a larger role in rural conditions where grid extensions would be too expensive without complementary demand. Hence, the development of off-grid, clean, and green energy resources such as biomass, solar, wind, and geothermal becomes imperative for low-income households.

1.2. Tracking Energy Poverty and Millennium Development Goals (MDGs) Achievement in ASEAN from the Context of Low-Income Households

Provision of renewable energy sources could contribute for low-carbon development. The recent White Paper by the Department for International Development defines low-carbon development in the following way:

- Using less energy, improving the efficiency with which energy is used and moving to low- or zero-carbon energy sources;
- Protecting and promoting natural resources that store carbon such as forests and lands;
- Designing, disseminating and deploying low- or zero-carbon technologies and business models; and
- Policies and incentives that discourage carbon-intensive practices and behaviour.

Low-income ASEAN households have contributed the least to global environmental problems such as climate change. For them, clean energy provision is not about cutting carbon emissions but about providing benefits and opportunities as a result of economic growth. This includes access to basic energy services and utilities that eventually improve the quality of life and achieving the MDGs. Although MDG 8 is highly related to environment sustainability as this goal is to stop the unsustainable exploitation of natural resources, access to energy is directly related to almost all the MDGs (Table 4). For example, expanded access to energy services will also allow better health and educational services for the elderly, young mothers, and children in poor households.

Table 4: Millennium Development Goals (MDGs) and Their Overlaps with Energy Issues

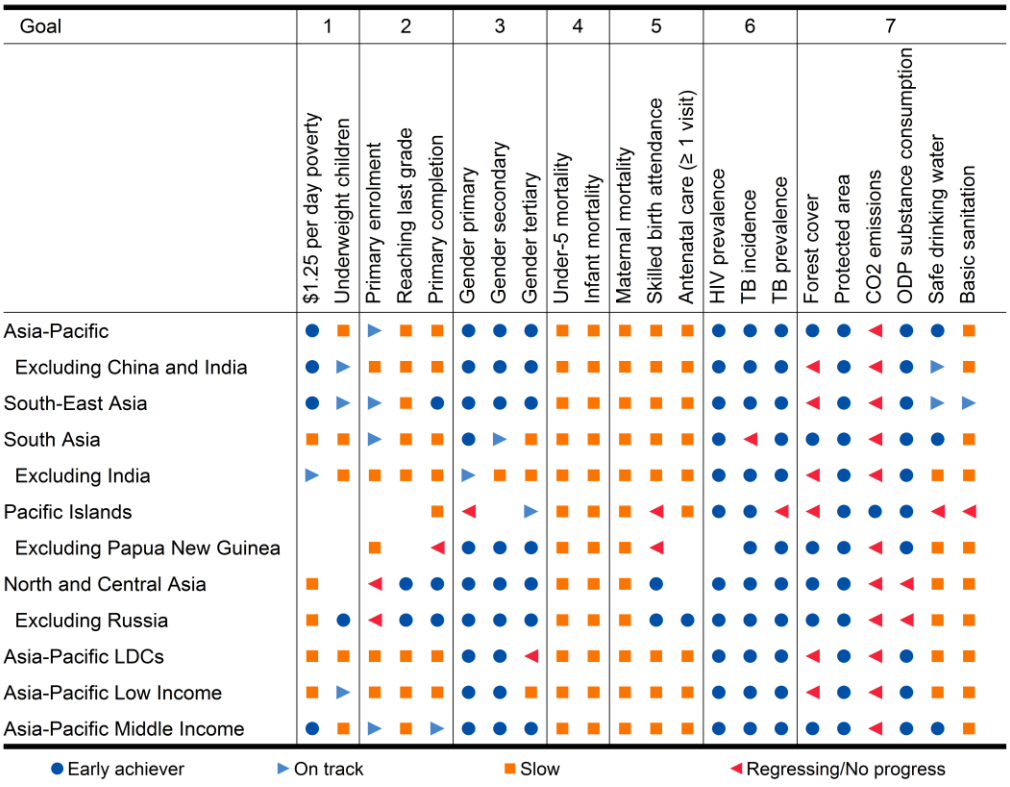
Millennium Development Goal	Role of Energy
1. To halve, between 1990 and 2015, the proportion of the world's population whose income is below US$1 a day	Expanded access to energy services and, to some extent, agroforestry can lead to increased income for beneficiaries
2. To halve, between 1990 and 2015, the proportion of people who suffer from hunger	Expanding access to energy services and agroforestry increases food productivity.
3. To ensure that, by 2015, children everywhere will be able to complete a full course of primary schooling	Access to energy services allows development of more schools. Energy access allows children to have adequate lighting during the evening whilst studying.
4. To ensure that girls and boys have equal access to primary and secondary education, preferably by 2005, and to all levels of education no later than 2015	Increased access to modern energy services allows women and children to have more time for education rather than gathering wood for fuel. Access to modern energy services reduces exposure to high levels of indoor pollution caused by dirty energy systems.
5. To reduce by two thirds, between 1990 and 2015, the mortality rate for children under the age of five	Expanded access to energy services will allow better health services for children.
6. To reduce by three-quarters, between 1990 and 2015, the rate of maternal mortality	Expanded access to energy services will allow better health services for pregnant women.
7. To reduce the prevalence of HIV/AIDS, malaria and other major diseases	Expanded access to energy services will allow better health services overall, including rural areas, and better preventive measures.
8. To stop the unsustainable exploitation of natural resources	Mitigating climate change can reduce unsustainable exploitation of natural resources and increase access to renewable resources.

Source: Asian Development Bank Institute, 2013.

Figure 3 shows the levels of selected MDG targets in regions within Asia, with MDG indicators pointing in various directions. Whilst the ASEAN is an early achiever in half of the indicators, it is off track in the other half. It is, for example, progressing only slowly in reducing carbon emissions but moving backwards in the proportion of land area covered by forests. Moreover, regional averages invariably mask disparities between countries and between urban and rural areas. Even for one indicator where ASEAN is already an early achiever, many AMS are lagging within the region. For instance, although ASEAN is an early achiever in poverty and education, the group of

Cambodia, Lao PDR, Myanmar, and Viet Nam (CLMV) are expected to miss the target due to several reasons, including lack of energy access.

Figure 3: Tracking MDG Achievement in ASEAN



Note: CO_2 = carbon dioxide, HIV = Human Immunodeficiency Virus, LDC = least-developed country, ODP = Ozone Depleting Potential, TB = tuberculosis.
Source: United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP), 2012.

In other words, to make growth inclusive, access to energy is necessary. Key policies and business models can be devised to link households with clean energy products and services depending on the community's priorities, plans, and availability of funding and technologies. It is important that new services targeting those in poverty should focus both on the supply and consumption side of these households and also their ability to develop with the least emissions and pollutions.

2. Adoption of Clean Energy Products and Services by Low-Income Households

The consumption patterns of urban and rural households differ. In rural settings, the amount of electricity supplied could only support a floor fan, two compact fluorescent light bulbs, and a radio for about five hours per day. Whilst in the urban areas, consumption would also include a television and another household appliance such as an efficient refrigerator or a computer. At the micro-level, there has been a growing interest in efficient low-cost lighting through the distribution of compact fluorescent light bulbs (CFLs) in many ASEAN countries. These high-quality CFLs are four to five times more efficient and last longer than average lucent bulbs. The mass dissemination of CFLs is expected to reduce peak electricity needs and costs, and also presents a business opportunity for the private sector to exploit.

In terms of investments, it has been estimated that a cumulative investment of US$223 billion would be required between 2010 and 2015 in order to achieve the MDG of eradicating extreme poverty and hunger by 2015 and another US$477 billion between 2016 and 2030 to ensure universal access to electricity by 2030. Rural areas will receive the bulk of additional household electrification in this period through grid and off-grid solutions because by 2015 most of the urban households in Asia are expected to be given access to electricity services. A high household density is the most important aspect in providing electricity access through the grid as the megawatt-hours (MWh) delivered through an established grid is cheaper than that through mini-grids or off-grid systems but the cost of expanding the grid to less populated areas is very high, with accompanying transmission losses and unprofitability. A large share of the rural households that are to be connected by off-grid and mini-grid options will include alternative sources of energy including solar photovoltaics (PV), mini-hydro, biomass, wind, diesel, and geothermal. The current total primary energy supply (TPES) situation amongst ASEAN countries can be seen in Table 5. Whilst large Asian countries including Indonesia and Malaysia are more dependent on coal for their energy supply, other low-income countries like Cambodia, Myanmar, and the Philippines are dependent on biomass for energy.

The bulk of investment on electrification in the next five years is expected to occur in ASEAN countries as a result of rapid economic growth. Low-carbon renewable energy as a share of grid extension in rural areas is expected to increase, although currently it is not cost-effective. There is great investment and business opportunities in developing small, standalone renewable energy technologies that could meet the electricity needs of rural communities at a cheaper price. The proliferation of specific green technologies such as solar PV for lighting and clean drinking water have great potential. For a greater load demand, other technologies such as mini-hydro or biomass might offer a better solution but solar PV is expected to improve efficiency and could be used on a mass scale as prices would eventually drop. The main challenge with solar PV and wind technologies is their high upfront cost, which demands new and innovative business models and financial tools to improve dissemination. The mini-grid is also being considered as the best probable approach to rural electrification as it can combine different sources of energy and ensure stable supply and transmission of electricity.

More appalling than the number of people with no access to electricity is the current number of people in ASEAN countries who primarily rely on biomass including wood, charcoal, tree leaves, and crop residues used in inefficient devices for their cooking and heating needs (Figure 4). This number is expected to be higher than the current estimate of 10 million as a result of population growth, rising liquid fuel costs, and global economic recession risks. The negative effects of traditional forms of energy —specifically the combination of biomass and waste as fuel; traditional mud stoves, metal, cement, pottery or brick stoves as cooking or heating containers; and the absence of chimneys or hoods)—on health, economic development, and the environment have been covered by various studies. This setup emits pollutants inside the house to high levels and is predicted to be many times higher than typical outdoor levels, even higher than that of a polluted, industrialised city. The World Health Organization (WHO) estimates that more than 1.45 million people at the global level, mostly children, die prematurely each year from household air pollution due to inefficient biomass combustion. Switching from traditional biomass to advanced biomass technologies or liquefied petroleum gas (LPG) has positive effects, including

reduction in emission of greenhouse gases, sustainable forests, greater energy efficiency, and better health and sanitation conditions.

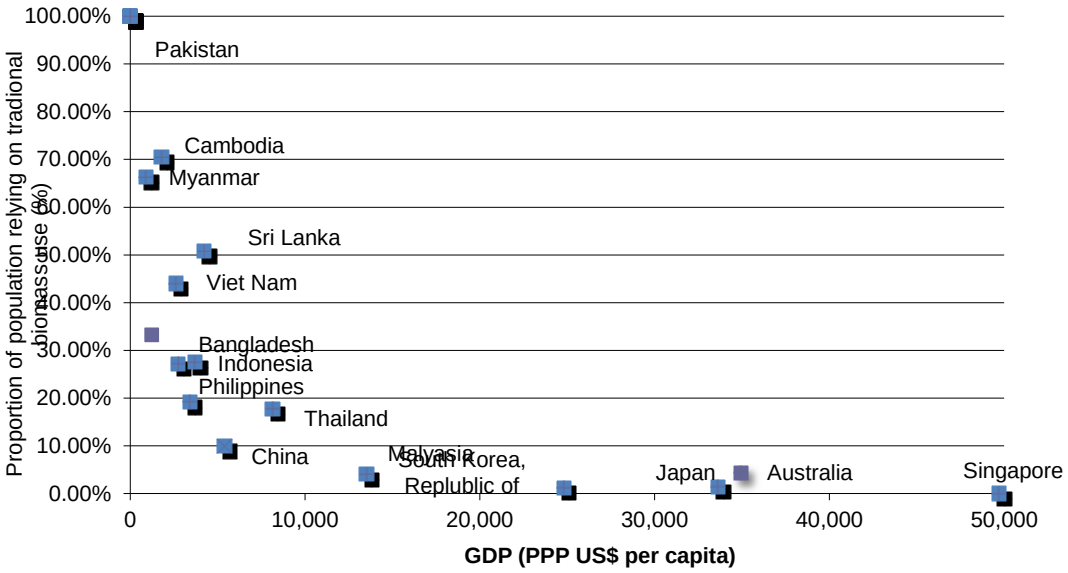
Table 5: Total Primary Energy Supply (TPES), Share of Renewable Energy, Electricity Consumption and Electrification Rates in Selected Asian Countries

	Annual Total		Share of fossil fuels in TPES			Share of renewable energy in TPES			Electricity consumption / Per Capita		Electricication Rate
	Tons of oil equivalent (millions)		Coal	Natural Gas	Oil	Hydro, solar, wind, and geothermal	Biomass and waste %	Share of nuclear in TPES	kilowatt hours	% change	% of population
Country	1990	2006	2006	2006	2006	2006	2006	2006	2006	1990–2006a	2000–2006b
Australia	87.7	122.5	43.9	19.1	31.6	1.3	4.1	0.0	11309.0	34.6	100.0
Cambodia	0.0	5.0	0.0	0.0	28.4	0.1	71.3	0.0	88.0	..	20.0
China, People's Republic of	863.2	1878.7	64.2	2.5	18.3	2.2	12.0	0.8	2040.0	299.1	99.0
India	319.9	565.8	39.4	5.5	24.1	1.9	28.3	0.9	503.0	82.3	56.0
Indonesia	102.8	179.1	15.5	18.6	33.0	3.7	29.2	0.0	530.0	228.3	54.0
Japan	443.9	527.6	21.3	14.7	45.6	2.1	1.3	15.0	8220.0	26.7	100.0
Lao PDR	-	-	-	-	-	-	-	-	-	-	-
Malyasia	23.3	68.3	12.0	44.4	38.8	0.9	4.1	0.0	3388.0	187.5	98.0
Myanmar	10.7	14.3	0.8	12.4	12.7	2.0	72.1	0.0	93.0	104.5	11.0
New Zealand	13.8	17.5	11.9	18.7	39.4	24.0	6.0	0.0	9746.0	14.5	100.0
Pakistan	43.4	79.3	5.4	31.6	23.9	3.5	34.9	0.8	480.0	73.6	54.0
Philippines	26.2	43.0	13.4	5.8	31.8	22.9	26.1	0.0	578.0	60.7	81.0
Singapore	13.4	30.7	0.0	20.9	79.0	0.0	0.0	0.0	8363.0	72.1	100.0
Korea, Replublic of	93.4	216.5	24.3	13.3	43.2	0.2	1.1	17.9	8063.0	239.8	100.0
Sri Lanka	5.5	9.4	0.7	0.0	40.7	4.2	54.3	0.0	400.0	159.5	66.0
Thailand	43.9	103.4	12.1	25.8	44.4	0.7	16.6	0.0	2080.0	181.4	99.0
Viet Nam	24.3	52.3	16.8	9.5	23.4	3.9	46.4	0.0	598.0	511.2	84.0

Note: a – Denotes percent change in value of the variable within the given period.
b – Data are for the most recent year available.
Source: The World Bank (2010), *World Development Report 2010*.

A large amount of investments and business opportunities exist in disseminating biogas systems in rural areas as the consumption of LPG stoves in both rural and urban areas is estimated to reach US$2.6 billion annually in the next 20 years. The cumulative investments required for universal access to clean cooking facilities is estimated to be at US$56 billion from year 2010 to 2030, and about US$200 million in Southeast Asian countries (IEA, 2010).

Figure 4: Trends in Proportion of Population Using Traditional Biomass Energy (%) and GDP (PPP US$ per Capita) in Selected ASEAN and Non-ASEAN Countries



Source: The World Bank, World Development Indicators.

2.1. Clean Energy Enterprise Development

Low-income households can be considered as resilient, value-conscious consumers and creative entrepreneurs. They can be the engine of a new development strategy and a source of innovation for providing basic services in a green way. The strength of these innovative business models is that they tend to create opportunities for low-income households by offering access to energy and other services, and by encouraging endogenous development.

To begin to understand how this development is uniquely possible, the following basic assumptions hold good:

- Low-income households present a latent market for clean energy goods and services. Engaging them actively is a critical element for an inclusive and sustainable growth as entrepreneurship activities for this market create choices for them and foster competition amongst outside service providers. These characteristics of clean energy market economy are new to low-income households but can facilitate a dramatic change.

- Low-income households as a market provide new growth opportunity for outside businesses and a forum for innovation in developing renewable energy products and clean services in a cost-effective way that old and tried solutions cannot create.
- The clean energy market for low-income households must become an integral part of the private sector's work. For big companies, this must become part of the firms' core business and should not be merely relegated to the realm of corporate social responsibility initiatives. Successfully creating green markets for low-income households involves changes in the functioning of large companies as they need sustained resource allocation and senior management attention.

There is a significantly untapped opportunity for value creations happening at different levels and at a varying pace across ASEAN.

2.2. Managing the Transition to Modern, Clean Energy Services: The Role of Technology, Finance, and Skill Development

As previously stated, a substantial number of people from ASEAN still lack access to modern electricity and approximately 20 million rely on traditional sources of biomass-based energy. This situation implies that investment is either insufficient or not available to households at the bottom of the economic pyramid. The poor population is often willing to pay for better-quality energy but alternatives are frequently unavailable or may involve high access cost. Furthermore, the lack of information on the benefits of these technologies and the negative impact of indoor air pollution on health delay the penetration of renewables. Table 6 shows modern energy systems most applied in rural areas and their typical energy cost.

The range of prices for energy used in cooking and heating per kilowatt-hour (kWh) varies from US$0.02 to US$0.20, which is considerably more costly than conventional fuel such as wood. Analogous, clean energy sources for electricity generation are more costly than conventional coal/fuel oil thermo power plants. Most of the houses in the rural villages are scattered and far from the national grid, hence it is more costly to link them. Micro hydropower and solar power, however, are the alternative options for generating electricity, which are technically feasible, economically viable, and environmentally sound.

Table 6: Transition to Modern Energy Services in Developing Countries

Rural energy service	Existing off-grid rural energy sources	Typical energy cost (US$, kWh^{-1})	Examples of modern energy sources	Typical energy cost (US$, kWh^{-1})
Energy for cooking and heating	Wood, dung, agricultural waste incomplete combustion in open fire (efficiency ~15%)	~0.00	Improved cooking stoves (efficiency >25%)	n.s.
			Biogas from household-scale digester	n.s.
			Solar cookers	0.02-0.20
			Solar crop dryers	0.02-0.20
			Water heaters	0.02-0.20
Electrification	Candles, kerosene, batteries, central battery recharging, diesel engines and generators	0.03-0.20	Small electricity systems based on micro hydropower	0.05-0.40
			Small electricity systems based on biogas from household-scale digester	n.s.
			Smallscale biomass gasifier	0.08-0.12
			Mini-grid and solar/wind hybrid systems	0.15-1.00
			Solar home systems	0.40-0.60
			Biodiesel	30-80$cts/L
			Ethanol	40-80$cts/L

Source: Adapted from REN21, 2010.

In the past, private investors were reticent to invest in isolated power system due to problematic legal frameworks, poor tax or subsidy structures, and insufficient retailers to develop local markets (REN21, 2010). Nevertheless, in recent years, the trend in ASEAN has been to provide large amount of financing to local private or public banks that are committed to finance rural energy projects. Achievements are difficult to estimate at the regional level but significant accomplishments, especially in Indonesia, Malaysia and Thailand, have been observed. Several developing countries in South Asia such as Nepal, India, Pakistan, and Bangladesh have successfully put these technologies into practice but further efforts are needed to mainstream their potentials.

Since 1996, Nepal's government has been promoting micro hydropower (MHP) and solar home system (SHS) programs with local communities in rural villages, which has increased sustainable and affordable electricity access amongst the rural poor. Despite initial obstacles concerning high costs, lack of technical skills, and the

need for villagers to support the project as a whole community, these programs have been successfully implemented. A key driving force for its achievements is related to the financing mechanisms designed by the government to help to cover the initial capital costs (Pokharel, 2003). Other illustrative project includes the SHS program in Bangladesh. Similar to the Nepal initiative, the government of Bangladesh heavily incentivises the installation of SHS in rural areas. In the last severalyears, nearly a million SHS were installed and forecasts predicted an expansion of 1.3 million by 2012. The government established a rural energy fund in partnership with several nongovernmental organisations (NGOs) and microfinance groups that enabled a group of participating sales and service companies to install the systems. A key part of this program ensured that the systems met high quality standards and provided guarantees for the technology and after-sales service. To address these concerns, rural households were given proper technical skills and the capital to independently run the energy systems.

Aside from hydro and solar energy, biomass is also a green and affordable energy source with high potential to provide electrification in rural areas. In India, the Planning Commission developed an ambitious program called the National Biodiesel Mission. Under this program, strong incentives were given to the production of biodiesel from non-edible oil crops, especially *Jatropha curcas* and *Pongamia pinnata,* on marginal lands. Biodiesel provides an energy source that is environmentally friendly and has both social and economic benefits, including the capability to reduce greenhouse gas (GHG) emissions, increase energy security, and provide rural employment. If biodiesel is used to substitute kerosene in diesel engines, it also presents the advantage of providing clean and affordable energy to rural communities. Additionally, the government of India linked jatropha production in villages with the National Rural Employment scheme to boost employment in rural areas. Analysis from the National Biodiesel Mission reveals that between 2003 and 2007, over 164 million individuals were involved in plantation and seed collection of jatropha.

Despite technical and institutional difficulties that have delayed the penetration of biodiesel into the market, past experiences found that a bottom-up strategy, which involves local communities and includes the participation of households at the bottom

of the pyramid, are an ideal way to promote socio-political and economic changes in rural India (Agoramoorthy, 2009).

In summary, a slow transition from the traditional to market-based clean energy business development has been taking place in low-income households in ASEAN and beyond. The changing perspectives as observed in Indonesia are shown in Table 7 as an example.

Table 7: Changing Perspectives of Low-Income Households by Business and Policymakers in Indonesia

From	To
Low-income households pose a problem for development.	They represent a market. The private sector can and should participate effectively in this process.
Low-income households are wards of the state.	They are active consumers/entrepreneurs.
Low-income households do not appreciate low-carbon green technologies. Old technology solutions are appropriate.	Creative bundling of low carbon products and services with a local flavour
Follow the urban rich model of development.	Selective leapfrogging
Carbon efficiency in a known model	Innovation to develop a low- or zero-carbon model
Focus on resource constraints.	Focus on creativity and entrepreneurship.

Source: Authors.

It has to be pointed out that a much needed and desirable market-based clean business development for low-income households is in its infancy in most countries. This is mainly because it is not easy for individuals to give up traditional practices. Thus businesses and policymakers need to introduce these to them as markets that do exist, and stimulate a demand for clean energy and services through public policy. It is also difficult for a whole generation of low-income households to give up its dependence on their government's pervasive subsidies on oil. On the other hand, when subsidies are targeted to a specific population, this can advance the penetration of modern energy services to the poor, especially for those in rural areas (Modi et al., 2005). Governments therefore need to address a multitude of factors whilst designing

a specific subsidy to guarantee that the poorest fringe of the population will benefit rather than indirectly providing advantages to higher income households that already consume more.

3. Tracking Clean Energy Targets and Implementation Deficits in ASEAN

In ASEAN, the share of renewable energy in primary energy consumption was 28.1 percent in 2010, which is equivalent to 133 million tonnes of oil equivalent (MTOE) and is expected to grow at an annual rate of 9.1 percent to reach 185 MTOE by 2030. The renewable energy targets for individual countries are listed below in Table 8:

Table 8: Renewable energy (RE) targets set by selected ASEAN countries

Country	Target
Indonesia	2020: 20% of RE in demand, including biofuels
Malaysia	2010: 350 MW – grid connected RE
Philippines	2025: 100% increase in RE capacity from 2005
Thailand	2020: 20.3% RE in final demand
Viet Nam	2020: 5% RE in demand

Source: ACE, 2009.

Within the ASEAN context, governments are making efforts to effectively design energy policies by addressing the needs of low-income households. In the period 2004–2009, ASEAN has met its 10 percent target to increase installed renewable energy-based capacities for power generation. However, new technologies are very much at the experimental stage. Renewable resources such as geothermal, solar, and wind energy are still capital-intensive and not as affordable as conventional energy. ASEAN needs more technology transfer and meaningful partnerships to make these

energy sources viable for its increasing requirements. But ASEAN recognises that renewable energies are crucially needed to increase the diversity of energy supply and to reduce the environmental impact of energy use in the region.

The following strategic goals are set in the ASEAN Plan of Action for Energy Cooperation, 2010–2015:

- To achieve a collective target of 15 percent for regional renewable energy in the total power installed capacity by 2015;
- To strengthen regional cooperation on the development of renewable energy and alternative energy including hydropower and biofuels;
- To promote development of centres of research and development on renewable energy in the region; and
- To promote open trade, facilitation, and cooperation in the renewable energy sector and related industries as well as investment in the requisite for renewable energy development.

It is also envisaged that towards the end of the 2010-2015 period, clear policies and responsive plans and program for RE development will have been addressed to enhance commercialisation, investment, market, and trade potentials of RE technologies (Table 9).

Table 9: Strategic Action Pans to Achieve Collective Renewable Energy (RE) Targets

Strategy	Action
Increasing the development and utilisation of RE sources to achieve a 15% target share of RE in ASEAN power generation mix	- Promote technical cooperation to complement efforts on RE targets of ASEAN Member States - Promote national RE programs, available market and feasibility studies to investors, project developers, power utilities, and funding institutions - Monitor RE-installed capacity additions bi-annually
Enhancing awareness and information sharing and strengthening networks	- Organise media campaigns, conferences, seminars, and workshops, and RE competition under ASEAN energy awards - Sharing information on research and innovation policies, market deployment

	policies, and market-based policies including the promotion of successful cases of RE projects to encourage positive attitude in the further development of RE - Establish a network of R&D (research and development), training and education centres involved in RE to promote cooperation and synergy, with active participation of the private sector and other relevant organisations - Strengthen collaboration with leading regional and global RE centres to enhance ASEAN RE networks - Promote the use of clean development mechanism (CDM) in light of climate change and mitigation
Promoting intra-ASEAN cooperation on ASEAN made products and services	- Propose harmonised standards for RE products - Develop policies and systems to strengthen local manufacturing capabilities for RE technologies and products - Encourage investment in manufacturing and fabrication
Promoting RE financing scheme	- Establish the framework for promoting innovative financing instruments or mechanisms to support and enhance RE projects implementation - Encourage involvement of the banking sector and financial institutions in RE projects - Strengthen collaboration with ASEAN dialogue partners and international agencies to support RE projects in AMS
Promoting commercial development and utilisation of biofuels	- Establish a functioning network consisting of key players in the biofuels and related industries to pursue cooperative partnership in R&D and to promote sharing information - Enhance commercialisation of biofuels - Develop harmonised specification for biofuels
Developing ASEAN as a hub for RE	- Establish a working program task force to stockpile the development of RE and prepare RE road map

Source: ACE, 2009.

Renewable energy is now a development priority for AMS, one region which boasts an abundant supply of renewable energy resources. The countries are currently implementing a vision of renewable energy into progressive actions by engaging more renewable activities and enhancing greater regional collaboration. They are also working towards identifying areas where clean and renewable energy can be developed and deploying these innovations to mitigate the adverse impact of climate change as well. At the national level, each country has tried to come up with its own renewable energy policy.

Although countries in the region have set higher targets for renewables share in their national energy mix, the use of renewables in the region in general is still limited relative to their potential. In ASEAN, wind and tidal energy are largely untapped and the huge solar potential in the region remains underdeveloped.

The reasons are many. As the mechanisms of power generation from renewables are different from those of conventional energy sources, adopting renewable energy into existing national energy system is indeed a challenging undertaking. Renewable energy developments are capital-intensive, and are far less competitive than the dominant fossil fuel-based energy sources.

Table 10 presents a qualitative assessment of implementation deficit in five ASEAN economics.

The varying levels of performance could also be attributed to the fact that renewable energy sources are often located in remote areas, rendering connection to main power grids a significant technical hurdle. Cumbersome administrative processes arising from overlapping and uncertain regulations and a lack of coordination amongst relevant authorities further hinder clean energy penetration in the national energy market. Limited access to financing options and insufficient financial incentives also dissuade investors from participating in clean energy development in ASEAN.

Furthermore, it has to be highlighted that dipartites in the macroeconomic factors also affect the level of energy system development across ASEAN. Given this disparity, the suite of strategic actions will be at different stages of development within AMS but they provide an indication of where ASEAN should focus its efforts in the coming years.

Table 10: Qualitative Assessment of Clean Energy Policy Performances

Against Five Critical Strategies	Indonesia	Malaysia	Philippines	Singapore	Thailand
RE Targets	Regulator deemed unconstitutional and replaced in 2012	Independence of the regulator increased	Government appoints the commissioner of the energy regulator	Regulator is the statutory body of the government	Independent regulator apppointed by the monarch
Awareness	Green energy course for the general public Program to form green teams in organisation	Mandatory energy management for industry Mandatory minimum energy performance standard (MEPS)	No clear strategy for increasing clean energy awareness First nation to put MEPS in place	Promotion of solar power	RE development plan to improve public knowledge
Cross-border cooperation	Issues continue due to island geography	Grid connection to Thailand and Malaysia	Owing to island geography, issues remain with national energy integration	Ranked #1 in the World Economic Forum Enabling Trade Index	Bilateral cooperation in the Greater Mekong Subregion
Finance	Significant involvement of independent power producers (IPPs)	IPPs have access to the grid under the Feed-in Tariff (FiT) Program	Long history of involvement of IPPs	Energy services company (ESCO) accreditation scheme	Significant involment of IPPs
Government-led research and development (R&D)	FiT for solar and small RE projects Biofuel mandate	Green Technology Financing Scheme and FiT in place	FiT for micro RE Preferential purchase of RE	US$140M R&D clean energy scheme	FiT for small RE projects US$ million fund for clean energy projects

Notes:

Significant level of development

Some development

Significant development required

Limited progress

Sources: Accenture, 2014; ERIA, 2013.

Apart from technical and financial barriers, renewables also have a completely different set of environmental and socioeconomic costs. Although hydropower has fuelled the power trade in the Greater Mekong Subregion and has helped Thailand and Viet Nam meet their rapidly growing demand for power, the installation of hydropower dams have displaced communities, undermined the quality and quantity of water supply, and continued to disrupt the livelihood of people living in the Mekong River Basin. Meanwhile, in the Philippines and Indonesia, land acquisitions for geothermal developments are often met with strong opposition by locals.

As different stages of development entail different sets of challenges, each country needs to stay committed to overcoming the hurdles it faces so that the collective target that ASEAN has set can be achieved.

The commendable initiatives taken by ASEAN must be supported by strong commitments from member states. As renewable energy is a relatively clean form of energy, governments need to establish investors' trust for its profitability and people's trust for its utility and reliability. Efforts to shape a conducive environment for the renewable energy market are only a part of the equation as buy-in from the public is equally important to support the government's substantial spending on renewable energy and the ensuing infrastructural changes that will come with renewable energy usage.

Creating an enabling environment for renewable energy investments, which include implementing policies, enacting reliable regulations, and simplifying administrative processes, needs to take place at the national level.

When it comes to cooperation, governments need to identify priorities. Of the various initiated strategic actions and identified implementation deficits from the regional level, there are three collaborative efforts that will collectively accelerate renewable energy development in meaningful ways:

- First, conduct research to strengthen ASEAN manufacturing capabilities for renewable energy technologies and products;
- Second, establish innovative financing instruments and mechanisms; and
- Third, standardise and harmonise ASEAN-made clean energy products from low-income households.

Building the capability to manufacture and operate technologies at the community level will make clean energy significantly cheaper. It needs training and skills development. Having a secure financial assistance mechanism will greatly support renewable energy development in its earlier stages. Furthermore, standardising and harmonising systems before the renewable energy market is fully developed will put into place a good foundation for continuing future cooperation. Getting things right from the outset, after all, will cost less than refurbishing them later. To this end, governments in the region need to stay strongly committed to clean energy development.

4. Fiscal Policy Framework for Accelerating Clean Energy Provision for Low-Income Households in ASEAN

Evidence suggests that without effective financial systems, all market actors cannot sustain their businesses. Therefore, policy interventions are necessary to encourage and financially support low-income households to adopt the best, available clean energy technologies and incorporate innovative practices towards an environmentally beneficial direction.

Table 11 shows the estimates of relative subsidies available to produced energy. A new global survey by Rogus (2012) has found that a full 100 percent of companies in Singapore have declared that government tax breaks are required to accelerate clean energy investment incorporation. If governments are serious on meeting ambitious clean energy targets and promoting consumerism in low-income households, they need to properly incentivise environmentally aligned corporate behaviour. At the moment, clean energy provisions are often limited in range and largely operate on a premium price. Tax breaks will enormously help accelerate take-up and will also help create a mass market where unit prices fall as observed in India.

Table 11: **Estimates of Relative Subsidies to Energy Sources**

Energy type	Subsidy estimate (US$ billion/year)	Energy produced	OECD share of production (2007) %	Subsidies per energy unit (US$ cents/kWh)
Nuclear energy	45	2,719 TWh electricity	84	1.7
Renewable energy (excluding hydroelectricity)	27	534 TWh electricity	82	5.0
Biofuels	20	34 MTOE	68	5.1
Fossil fuels (non-OECD consumers)	400	4,172 MTOE	n.a.	0.8

Notes: OECD = Organisation for Economic Co-operation and Development, kWh = kilowatt-hours,
TWh – terawatt-hours, MTOE = million tonnes of oil equivalent.
Source: Preliminary estimates based on GSI (2010), available at
http://www.globalsubsidies.org/files/assets/relative_energy_subsidies.pdf

Pigou (1920) recommended that environmental incentives should internalise the cost of those responsible for external, negative social, and environmental impacts. Hence, the internal cost to the polluter could be made equal to the cost of the damage caused in monetary terms. In addition, Pigou also stated that positive externalities (e.g. promoting clean energy adoption amongst high- and low-income households) should be encouraged by subsidies instead of being taxed. Pigovian taxes inspired economic theory and are currently being implemented in numerous environmental policy instruments, such as the 'polluter pays' principle, amongst others. The imperatives are:

(i) Green energy enterprises produce positive externalities that are not factored in to either the production or purchasing decisions. If, for example, a greener production process lessens carbon emissions, then an incentive equal to the value of positive externalities could be given to the producer. Similarly, on the consumer side, if the use of the good produces positive externalities that are not captured in the price of the good, a subsidy or a tax break could be provided.

(ii) If nongreen energy companies or products generate negative externalities but no tax or disincentive is levied, then governments could either tax these firms or alternatively provide incentives to the green firms. This is an attempt to get the 'mix' of green/nongreen industries correct. In the absence of either (i) or (ii), giving incentives can lead to inefficiency in the use of resources. In order for governments to use these methods to green firms, it does require resources and know-how. Fortunately, working models already exist.

Green incentives, subsidies and tax breaks, are instruments designed to provide economic incentives to correct market failure in pollution control. These encourage enterprises to reduce loads on the environment whilst tax revenues can be spent either on promoting more environmentally friendly practices or used to create double dividends (Paras, 1999). The standard practice of incorporating the costs of environmental damages into the price of the goods and services, thus jacking up energy prices, may create incentives for producers and consumers to shift their activities to cleaner energy activities.

Furthermore, if AMS are to meet the requirements of inclusive and clean energy-based growth, they will need to invest considerable sum. Many are already doing so. Table 11 summarises the expenditures of governments that have implications on investment on poverty alleviation and preservation of environmental resources. Countries with higher per capita income are spending more on social infrastructure. One reason why government expenditure on clean energy in AMS might fall short of expectation is concern about fiscal deficits. Countries with high fiscal deficits have usually been advised to cut public expenditure – and the simplest cuts are often those on social and environmental expenditure.

If governments are to spend more on clean energy programs targeting low-income households, this should be part of a larger Environmental Fiscal Reform (EFR) program where EFR will be complementarily integrated along with other environmental measures that meet environmental objectives as well as economic and social objectives. EEA (2006) underlines that rather than defining the best instrument, policymakers should try to understand which mix of instruments is better applied under certain local and political conditions. The notion behind the concept of an EFR is the same in developed and developing countries, as the OECD states in a recent report: 'Environmental fiscal reform (EFR) refers to a range of taxation and pricing measures which can raise fiscal revenues whilst furthering environmental goals (OECD 2005, p.12).' In other words, EFR describes policy measures that overlap environmental and fiscal policies, and its implementation is not limited to developed countries but to transition or developing countries as stated in recent reports separately published by OECD (2005) and World Bank (2005).

Governments therefore need to channel revenues from environmentally damaging activities to create incentives that promote clean energy programs. Inevitably, this reform will have negative consequences as some economic sectors will be 'net losers' with increased tax burden compared to other economic sectors that will be 'net winners' with reduced tax burden. Apart from environmental benefits, an economic benefit may be achieved as the reduction of labour taxes may lead to an increase in employment. Trade-offs between social and environmental considerations need to be carefully analysed. Charges, taxes, and pervasive subsidies reduction tend to have benefits on the environmental aspect but bring low or moderate impact on poverty alleviation or economic development strategies. Subsidies enhance environmentally sound programs and reveal positive impact on the environment, poverty reduction, and economic growth. Nonetheless, ASEAN governments should keep revenue neutrality and ensure that they only pledge monetary support without distorting the markets. In addition, governments may also wish to provide transparent and timely information about expected impact of reforms to relevant stakeholders.

One of the strategies to minimise potential negative impact of taxes encompasses implementing well-targeted redistribution, and poverty alleviation policies. Target subsidies, including multiple price systems and lifelines tariffs, usually perform better than universal subsidies. Compared to universal subsidies, target monetary subsidies tend to have lower inclusion discriminations as they specifically address low-income households.

Past experiences reveal that in many ASEAN countries, economy and fiscal priorities have been the main drivers behind fiscal policies. These reforms also bring beneficial environmental impacts such as reduction of pervasive subsidies and taxation of natural resources, which contribute to a more rational energy consumption and environmental protection. Recently, Malaysia and Indonesia sharply increased user taxes on fossil fuels. However, commonly instituted fiscal reforms are regressive and resulted in social costs, especially for those at the bottom of the economic pyramid. When governments introduce bulk taxes without compensatory measures, ramifications may include an increase in the prices of basic goods and services that are consumed by the poor. Policymakers are thus facing the challenges of balancing economic efficiency, and political and social acceptability against environmental

effectiveness. When trying to simultaneously address fiscal, environmental, and social concerns, the design of EFR policies seems to be the key to guarantee that poverty reduction benefits go hand in hand with environmental preservation. In this view, the design of EFR should explicitly consider revenue neutrality, guarantee double dividend, avoid distributional and competitiveness effects, and address institutional limitations. The following paragraphs briefly portray these aspects and state recommendations towards fully achieving a sustainable EFR.

Table 12: Components of Government Spending, Emissions, and Public Debts

Country	GDP Current US$ Billion (I)	Public Debt (% of GDP) (II)	Population (million) (III)	GDP per capita (Current US$) (iv)	CO_2 emissions per capita (ton / capita) (V)	Education (% of GDP) (VI)	Health (% of GDP) (VII)	Research and Development (% of GDP)(VIII)	Military (% of GDP) (IX)	Debt service (% of GDP) (X)	Tax Revenue (% of GDP) (XI)
Year	2012	2012	2010	2009	2009	2000-2012b	2000-2012b	2000-2012b	2012	2012	2012
Australia	1039.42	14.3	21.50	48,499	18.48	4.7	6.0	2.2	1.8	-	23.1
Bangladesh	79.55	39.4	164.40	497	0.29	2.4	1.1	-	1	1.2	8.8
Cambodia	10.34	-	15.10	710	0.31	1.6	1.7	0	1.1	0.4	8.2
China	4532.79	15.6	1,354.10	3,422	4.92	1.9[d]	1.9	1.5	2	0.8	9.4
India	1214.21	54.9	1,214.50	1,065	1.25	3.2	1.1	0.8	2.6	2.7	12.9
Indonesia	510.50	28.3	232.50	2,246	1.69	3.5	1.2	0	1	4.8	12.3
Japan	4886.97	172.1	127.00	38,268	9.02	3.4	6.5	3.4	0.9	-	-
Lao PDR	5.47	-	6.40	882	-	2.3	0.8	0	0.4	3.8	10.1
Malaysia	221.16	41.5	27.90	8,187	6.7	4.5	1.9	0.6	2	4.1	16.6
Mongolia	5.26	-	2.70	1,991	4.33	5.1	3.5	0.2	-	1.4	23.2
Myanmar	-	-	50.50	-	0.24	1.3	0.2	0.2	-	-	3.3
Nepal	12.61	-	29.90	438	0.12	3.8	2.0	-	2	1.3	10.4
New Zealand	115.45	17.4	4.30	27,045	7.74	6.2	7.1	1.3	1.1		31.7
Pakistan	165.18	51.0	184.8	994	0.81	2.9	0.8	0.7	2.6	1.8	9.8
Philippines	167.49	56.9	93.60	1,854	0.8	2.6	1.3	0.1	0.8	6.6	14.1
Singapore	193.33	95.9	4.80	39,950	9.16	2.8	1.0	2.6	4.1	-	14.6
Korea, Replublic of	931.40	24.4	48.50	19,162	10.31	4.2	3.5	3.5	2.8	-	16.6
Sri Lanka	40.72	81.1	20.40	2,020	0.61	-	2.0	0.2	3.6	3.1	14.2
Timor-Leste	0.50	-	1.20	453	-	7.1	11.5	-	4.7	-	-
Thailand	272.46	38.0	68.10	4,043	3.41	4.9	2.7	0.2	1.5	6.3	16.5
Viet Nam	90.64	48.8	89.00	1,051	1.19	5.3	2.8	0.2	2.4	1.5	-

Notes: CO_2 = carbon dioxide, GDP = gross domestic product.

b - Data refer to the most recent year available during the period specified; d – Refers to an earlier year than that specified

Sources:

I – World Bank database

II – Central Intelligence Agency, 2010; https://www.cia.gov.ph (accessed 15 November 2010).

IV – http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD.WB

V – 2010 Key World Energy Statistics, IEA; World Bank, Where is the Wealth of the Nations? (2006) (data is from 2000); IEA database (2008)

VI to XI – Human Development Report 2010, United Nations Development Programme.

5. Epilogue

The ASEAN Economic Community (AEC) is dependent on a continual expansion of debt and is also driven by resource consumption that is environmentally unsustainable, socially exclusive, and economically unstable. The time is now ripe to

develop a new socio-cultural microeconomic framework that focuses on providing access to basic services to low-income households in a cost effective and ecologically sustainable way.

International pressure to abate carbon emissions is growing, encouraging ASEAN economies to green their growth paths. However, whilst increasing carbon emissions need to be controlled, uninterrupted basic services also need to be provided to the poor. Such clean energy and green strategies could be beneficial for low-income households if they become a part of low-carbon and less-pollution-oriented production systems whilst promoting local entrepreneurial activities at the same time.

What is needed is a better approach to help the poor, an approach that actively engages them in innovating and developing clean products and green services to achieve a sustainable win-win scenario with the help of profitable enterprises. The penetration of clean energy business models in low-income households in AMS is constrained by inherent weakness in terms of market responsiveness.

Integrated energy, fiscal, educational, skill enhancement and social development policy actions can help to tackle these challenges in either short or medium term. There are three important options:

- *Flexible redistributive and transformative public expenditures to overcome bottlenecks in clean energy* operation

  Fiscal policies can redistribute the benefits of growth through pro-poor public expenditure. Governments can effectively use revenues from economic growth to provide basic services aligned with renewable energy designed to be explicitly pro-poor and green through broad-based expenditure on low carbon resources in the rural areas. This provides an opportunity for the benefits from economic growth to be more inclusive and in a manner which is not likely to have major disincentive effects in the future. Increased spending on clean energy infrastructure though is likely to be an important cornerstone for future growth.

- *Flexible subsidies and financial sector development to increase the rate of green enterprises that also provide job creation*

  It is important that clean energy program is associated with significant job creation to provide opportunities for rural people to innovate and benefit from new entrepreneurial skills to move out of poverty. However, the record level of employment creation as a result of clean energy provision has been weak in many AMS. An increased level of entrepreneurial activity through skill

development and specialised job training is therefore an important prerequisite that entails substantial financial sector development.

– *Broad-based fiscal reforms for inclusive and green growth*

  The argument of environmental tax reform—a shift in the burden of taxation of economic goods (e.g. income) to ecological 'bads' (e.g. pollution)—has been broadly accepted but the progress towards this goal is painfully slow in ASEAN. There is an urgent need to achieve an order of magnitude to step change the structure of taxation. A sustained effort by governments is now required to design appropriate mechanisms for shifting the burden of taxation from incomes onto resource consumption and emission reduction to augment clean energy development. A further requirement here is to adjust fiscal policy frameworks to systematically account for socioeconomically disadvantageous groups.

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