

# ASEM Eco-Innovation Index 2017

## Country Report

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PHILIPPINES





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## EXECUTIVE SUMMARY

The Republic of the Philippines, is a Southeast Asian country known for its archipelagic character consisting of more than 7,000 islands, geographically and politically divided into three major groups: Luzon (north), Visayas (central), and Mindanao (south). It has a land area of approximately 300,000 square kilometers with a coastline measurement of 37,008 km. The country's population was estimated to have reached 104, 256, 076 people as of July 2017. It is known to be the 13th most populated country in the world. It was predicted that by 2050 the ranking of the Philippines would be the same (UN, 2017). The Philippines population is young having a triangular population pyramid. This means that it is composed of mostly 0-14 years of age (33.39% of the population). It can be inferred that the dependency rate of the Philippines is high with a total dependency ratio of 58.2 in which 51 is youth dependency and the remaining 7.2 is the elderly dependency ratio. With this, it can be said that the work force is not enough to support the needs of the youth and the elderly.

The Philippines' population growth rate is relatively high in 1.57 in 2017. This can be attributed to the advancements in technologies in health care system, and to the low death rate (6.1 deaths/1,000 population). The fertility rate of an average woman in the country is 3.02 children born. The life expectancy for the male Filipinos is 65.7 years and 72.9 years for females. Lower life expectancy for males can be attributed to their involvement in high-risk jobs (CIA, n.d.).

AS to the economic situation of the Philippines, it is known to be one of the fastest-growing economies. It is currently one of the most vibrant economies in the East Asia region, with healthy economic fundamentals and a globally known competitive workforce. Despite a weak external economic environment, the Philippines economy grew by 6.9 percent year-on-year in the first half of 2016, making it the strongest performer among major East Asian developing economies. The country's economy is expected to remain very positive with growth projected at 6.9 percent in 2017 and 2018 according to the World Bank. Growth in recent years went hand-in-hand with job creation and poverty reduction. World Bank accounted poverty reduction on the increase of employment opportunities, low inflation, and increase in income of the workers.

The new Philippine Development Plan 2017-2022 was approved in February 2017. Globally, it outlines the government's medium-term policy priorities to achieve more inclusive growth. The government is embarking on an ambitious reform agenda to deliver equitable tax reforms, enhance market competition, and improve the ease of doing business, while continuing to sustainably ramp up public investments in infrastructure and social services. The PDP 2017-2022 also considers the country's international commitments such as the 2030 Sustainable Development Goals.

In so far as the national production factors, these include the a) institutions, b) human resources, c) technology and innovation and d) infrastructure. According to the Global Competitiveness Report 2015-2016 published by World Economic Forum, the Philippines' institution was ranked in the 77th out of 140 with the score of 3.8 out of 7. For the property rights and intellectual rights, it was ranked in the 78th and 71th place out of 140, respectively. As to human resources, the Philippines' HDI value for 2015 is 0.682— which put

the country in the medium human development category—positioning it at 116 out of 188 countries and territories. Between 1990 and 2015, Philippines' HDI value increased from 0.586 to 0.682 within 25 years, an increase of 16.3 percent. The ratios for higher education and college education were 84% and 28.2%, respectively. Quality of math and science education was ranked in the 67th place out of 140 (Global Competitiveness Report 2015-2016, WEF). Another major benefit is the Philippines' large English-speaking population.

As to technology and innovation, Filipino's investment in technology development is seen to be quite insignificant while capacity for innovation appears quite high.

As to the infrastructure, the quality of overall infrastructure seems very low. Infrastructure, by definition, undergirds a country's socioeconomic development. The more strategically distributed it is (both sectorally and spatially) the better it is for inclusive growth and sustainable development. With a growing economy, the Philippines requires more and better selected infrastructure investments, given its archipelagic landscape, expanding population and rapid urbanization.

Market and corporate structure in the Philippines showed that high level of local market competition in the area was observed with the score of 5.2 out of 7, while the extent of market dominance was a quite high level by ranking 87th among 140 countries (WEF 2015-2016). The Philippine Competition Act is in place, it remains to be seen how the law will accomplish its much-awaited goal of putting an end to monopolies and cartels that hold Filipinos hostage with inexplicably high prices or poor quality in basic commodities and services.

As to the environmental issues, the Philippines is an active party in signing different international treaties that are related to the environment. The Central Intelligence Agency provided a list of environment-related international treaties or multilateral environmental agreements (MEAs) that the Philippines signed and ratified which include the following (CIA, n.d.): Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling;

and signed, but not ratified Air Pollution-Persistent Organic Pollutants.

The current administration is campaigning for its pro-environment and pro-people agenda. There are efforts in solving issues related to mining and water pollution to include water and air pollution, solid waste management, and issues on mining.

In so far as the Eco-Innovation Performances in the Philippines, efforts are being done to achieve sustainable production, resource efficiency and reduce greenhouse gas (GHG) emissions for environmental protection for immediate economic gains. Environmental sustainability now stands as a vital component of most governments' national agenda.



## EXECUTIVE SUMMARY

The 2017 Global Innovation Index (GII), a tool to evaluate the multi-dimensional features of innovation and in formulating policies to stimulate long-term output growth, productivity and trade, reported that the Philippines ranked 73rd among 127 economies in innovation garnering a score of 32.5 out of 100. This is a slight improvement from the score 31.8, ranking 74th out of 128 economies in 2016.

Philippines strongest indicator of innovation is research talent in business enterprise. It is defined as the percentage in an enterprise of researchers “as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, as well as in the management of these projects”. The country ranked 8th (75.5 score) in the world for 2017, a steep jump from 18/127 last 2015 (65.1 score), belonging to the business sophistication pillar. Also, the country ranked 9th in the world in terms of Firms Offering Formal Training indicator with 74.4 score.

In terms of weak performances, the country performed poor in most of the indicators of the seven pillars of innovation. The factors behind the weak performance of the STI sector are as follows: weak science and technology innovation (STI) culture; low government spending on STI; inadequate science and technology human resources engaged in STI R&D; difficulty in growing employment opportunities and retaining S&T human capital; limiting regulations that hamper the implementation of R&D programs and projects; and inadequate STI infrastructure.

With regard to the policy landscape towards circular economy, Philippine policy and legislation provide the overarching framework for the development of circular economy of the country. With the absence of the development of legislation to regulate environmental problems brought about by rapid urbanization and globalization, circular economy would have far less at grip. Green growth policies are of integral part of the structural developments needed to foster competitive, more sustainable and inclusive growth. In achieving circular economy, government regulations should be predictable, consistent and challenging but with realistic targets at the same time. Circular economy requires strategic elements to measure economic output and progress. These include energy efficiency, resource efficiency, meeting international production and process standards, fostering innovation, mitigating of conflicts deriving from the overuse of natural resources, attracting foreign investments, natural resources and climate change resilience (Gutterer, 2015).

The Promotion of Green Economic Development (ProGED) program is a three-year initiative with the Philippines Department of Trade and Industry- Regional Operations Group (DTI-ROG) as the lead agency, and in partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the German international development cooperation agency. Concluded in the year 2016, it aimed at increasing the participation of more than 450 registered micro, small or medium-sized enterprises (MSMEs) in 19 provinces with initial focus on the tourism sector due to its linkages to upstream and downstream industries.

Identified integral elements in strengthening the Philippine industries include: 1) designing incentive mechanisms; 2) revising incentive/subsidy schemes; 3) giving a boost to the development of a green industry and service sector; 4) launching a green productivity initiative in cooperation with industry; 5) fostering green innovation on the national, regional, and international level; 6) facilitating international B2B cooperation for technology and knowledge transfer; 7) promotion of the Philippines as climate change resilient and environmentally sound production and service delivery location; 8) encouraging a green job initiative; 9) elaborate a long-term strategy to give coherent signals to the private sector, and 10) shaping a consistent framework for promoting green economic development.

The topmost challenge for strengthening the sustainability of the green industry is primarily the cost barrier which is understandably a substantial consideration for a Third World Country like the Philippines. Expenditures are expected to skyrocket in shifting to green ventures as additional costs will be incurred from acquiring the technologies in modifying the processes, and approaches to develop ecologically sustainable zones.

For the green manufacturing industries, the identified challenges that must be addressed in furthering this initiative are as follow: 1) complying with international product and process standards; 2) strengthening its capacity to innovate respectively to provide innovative services and products; 3) further developing its business models; 4) anticipating market developments, client preferences and developments of the regulatory framework; 5) relevant for domestic and international markets; 6) increasing significantly its productivity, correspondingly its cost performance; 7) responding to requests of society; 8) pro-actively incorporating emerging and existing risks such as risks of a changing natural environment and climate change.

Some eco-innovation in the Philippines include the following: 1) networks program: success in fishnet recycling; 2) rubber wastes becomes sole and flooring materials; and 3) Special Economic Zones.

There are a number of major actors (drivers) in the Philippines eco-innovation. The Department of Trade and Industry (DTI) is responsible for realizing the country’s goal of globally competitive and innovative industry and services sector that contribute to inclusive growth and employment generation. Under this department are the Philippine Board of Investments (BOI), Bureau of Product Standards (BPS); Bureau of Small and Medium Enterprises Development’ Investment Promotion Agencies (BSMED); and the Philippine Economic Zone Authority (PEZA). Other agencies include the Climate Change Commission (CCC); Commission on Higher Education (CHED); Department of Environment and Natural Resources (DENR); Department of Finance (DOF) and the National Economic and Development Authority (NEDA). NEDA is mandated to coordinate the development planning and policy formulation process, in order to achieve the objectives of sustainable economic growth coupled with an equitable distribution of income and wealth.

# 1. Background

Philippines, known as the Republic of the Philippines, is a Southeast Asian country known for its archipelagic character consisting of more than 7,000 islands, geographically and politically divided into three major groups: Luzon (north), Visayas (central), and Mindanao (south). It has a land area of approximately 300,000 square kilometers with a coastline measurement of 37,008 km. The Philippines is situated at the apex of the Coral Triangle, a marine area in the western Pacific Ocean having the most diverse marine ecological species in the world (WWF, n.d.; ADB, 2014). Home of more than 100 million Filipinos, Philippines is located 4° 25' and 21° 7' north of the equator causing the country to have a tropical weather condition. With its archipelagic form, there are several bodies of water that are surrounding the country (See Figure 1). The Philippines is near the Pacific Ocean (located in the East side of the country) where all tropical cyclones are formed. In the northern part of the country is the Luzon Strait (Bashi Channel), the West Philippine Sea (known as South China Sea before) located on its western part while the Celebes Sea on the South.



**Figure 1.** The Philippines geographic location

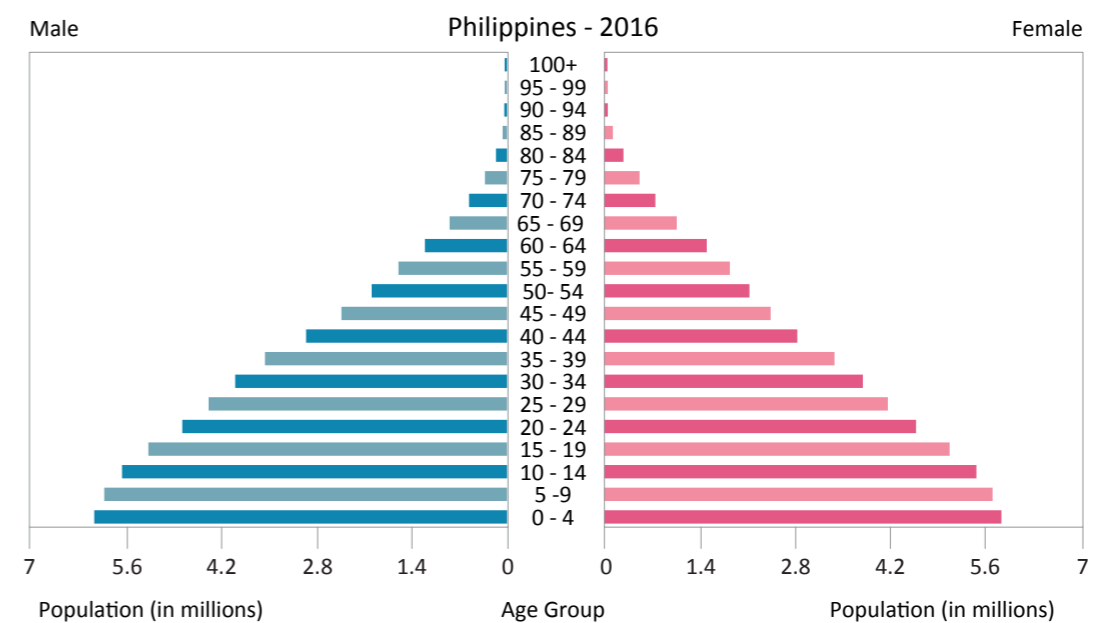
Source: CIA (<https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html>)

The Philippines is also located in the Pacific Ring of Fire (Circum Pacific Belt) or Typhoon Belt where most earthquakes and volcanic activities occur, and it also causes the Philippines to experience an average of 20 tropical cyclones each year (Agence France-Presse, 2013). Because of its location, the Philippines is reported to be the fourth most disaster-prone country in the world according to the United Nations Office for Disaster Risk Reduction (UNISDR) in 2015. Two hundred seventy-four disasters were recorded to hit the Philippines from 1995 to 2015, ranking next to India, China, and United States (Montenegro, 2015).

## A. Demographic Characteristics of the Philippines

In July 2017, an estimated 104, 256, 076 people are inhabiting the Philippines which is the 13<sup>th</sup> most populated country in the world. In 2050, it was predicted that the ranking of the Philippines would be the same (UN, 2017). Most of the Filipinos are native speakers of Tagalog and English. Aside from native Tagalog-speakers, the Philippines has speakers of its seven major dialects: Cebuano, Ilocano, Hiligaynon or Ilonggo, Bicol, Waray, Pampango, and Pangasinan. (CIA, n.d). With the country's geographic form and history, there is no doubt that the country's dialects are different from one another. To bind the country as one is the main rationale of President Manuel L. Quezon in making Tagalog as the national language to at least fill the gaps of diversity (Belvez, 2015). Being the only Christian nation in Asia, in terms of religion, the Philippines is mostly composed of Roman Catholics which is 86 percent of the population. Six percent of the population belong to the nationalized Christian cults, and two percent are following Protestant beliefs with over 100 denominations. The four percent of the population are the Muslims located in the southern islands of Mindanao, Sulu, and Palawan while the remaining two percent follow non-Western, indigenous beliefs and practices who are in isolated and scattered mountains in the Philippines (Miller, n.d.).

Based on the data from the World Factbook of the Central Intelligence Agency, the Philippine population is young having a triangular population pyramid (See Figure 2). This is different from the countries like Singapore, China, and Taiwan, all having more population in the labor force. This regular-shaped population pyramid means that the Philippines is composed of mostly 0-14 years of age (33.39% of the population). It can be inferred that the dependency rate of the Philippines is high with a total dependency ratio of 58.2 in which 51 is youth dependency and the remaining 7.2 is the elderly



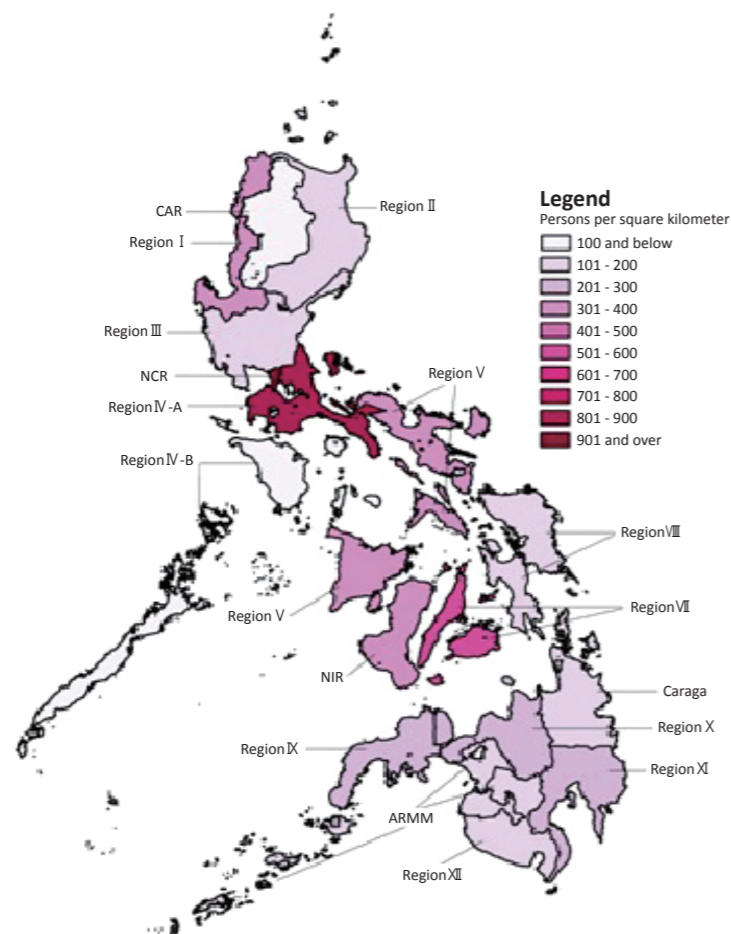
**Figure 2.** The Population Pyramid of the Philippines [CIA, n.d.]

Source: CIA (<https://www.cia.gov/library/publications/the-world-factbook/geos/rp.html>)

dependency ratio. With this, it can be said that the work force is not enough to support the needs of the youth and the elderly. That is why, child labor in the Philippines is becoming an option. This is supported by a report from the European Union in which they stated that as early as five years old, Filipino children are being engaged and involved in child labor and they are forced to induce drugs for them to work for 16 hours a day (The Manila Times, 2015). Based also on the population pyramid of the Philippines, males and females are of the same number across all ages.

The Philippines' population growth rate is relatively high in 1.57 in 2017. This can be attributed to the advancements in technologies in health care system, and to the low death rate (6.1 deaths/1,000 population). The fertility rate of an average woman in the country is 3.02 children born. The life expectancy for the male Filipinos is 65.7 years and 72.9 years for females. Lower life expectancy for males can be attributed to their involvement in high-risk jobs (CIA, n.d.).

The population density of the country increased in 2015 based on the 2015 Census of Population (POPCEN 2015). From 308 persons per square kilometer, the density increased to 337 persons per square kilometer. It can be seen in Figure 3 that the Southern Luzon (Cavite, Laguna, Batangas, and Rizal) part including NCR and Region V are densely populated. Based on the results of the 2015 cen-

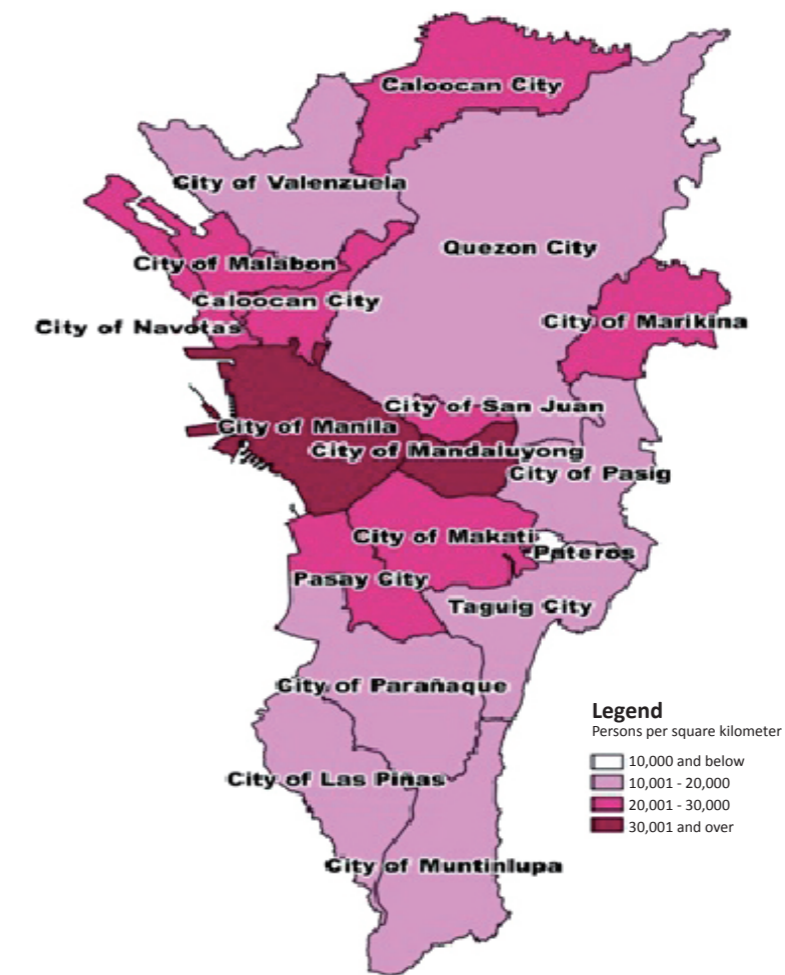


**Figure 3.** 2015 Philippine Population Density

Source: Philippine Statistics Authority (<https://psa.gov.ph/content/philippine-population-density-based-2015-census-population>)

sus, Rizal, among the 81 provinces of the Philippines, is the most densely populated province with a total of 2,439 residents per square kilometer. Cavite and Laguna followed Rizal with population densities of 2,410 and 1,573 persons per square kilometer respectively. These provinces are relatively near in the National Capital Region where there are more job opportunities are being offered and the most densely populated region in the country.

In terms of the highly-urbanized cities, eight of the 16 cities in the National Capital Region exceeded the population density of the region (See Figure 4). The most densely populated city among the 16 cities is Manila with 71,263 persons per square kilometer. Mandaluyong City is the second densely populated city with 41,580 persons per square kilometers and Pasay City with 29,815 persons per square kilometer.



**Figure 4.** National Capital Region Population Density

Source: Philippine Statistics Authority (<https://psa.gov.ph/content/philippine-population-density-based-2015-census-population>)



## B. Economic Situation of the Philippines

The Philippines has long been one of those countries that have fast-growing economies. It is currently one of the most vibrant economies in the East Asia region, with healthy economic fundamentals and a globally known competitive workforce. Despite a weak external economic environment, the Philippines economy grew **by 6.9 percent year-on-year in the first half of 2016**, making it the strongest performer among major East Asian developing economies including China, Vietnam, Indonesia, Malaysia, Thailand and Singapore (see below the figure). The country's economy is expected to remain very positive with growth projected **at 6.9 percent** in 2017 and 2018 according to the World Bank, sustaining its growth.

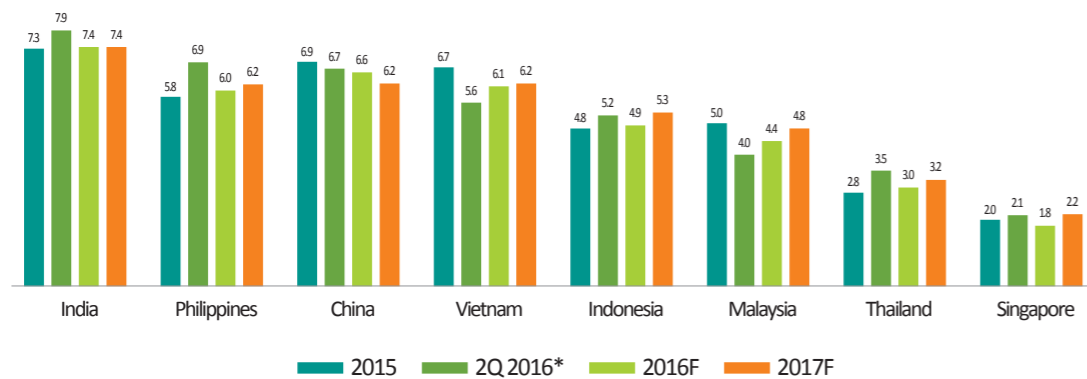


Figure 5. GDP Growth of Selected Asian Economies(%)

Source: IMF-WEO April 2016, July 2016 Update, Article IV consultations for forecast values, and various government websites for actual values

Growth in recent years went hand-in-hand with job creation and poverty reduction. The poverty rate declined from 10.5 percent in 2012 to 6.6 percent in 2015 by the \$1.90 a day poverty line. Between 2012-2015, shared prosperity increased: the income of the bottom 40 percent grew much faster than the national average. Specifically, the income of the bottom 20 percent grew at 16 percent while the average grew 6 percent. While urban and rural poverty declined, rural poverty remained nearly three times as high as in urban areas. Moreover, according to World Bank's Philippine Economic Update in April 2017, World Bank reported that the country reduced the unemployment rate to 4.7 percent in 2016 after producing 1.4 million net jobs. The rapidly growing domestic economy has created substantial gains in employment and poverty reduction making growth more sustained and inclusive.

However, even though the poverty incidence of the Philippines is declining, it can be seen (See Table 1) that the sectors who are mostly under poverty are the farmers and the fishermen who are both in the food production sector which is an ironic fact considering those who are producing food are the ones who are experiencing poverty in the country. The data are consistent throughout the years, from 2006-2015 (Bersales, 2017).

Sector	2006		2009		2012		2015		Increase/Decrease		
	Poverty Incidence (%)	CV	Poverty Incidence (%)	CV	Poverty Incidence (%)	CV	Poverty Incidence (%)	CV	2006 - 2009	2009 - 2012	2012 - 2015
Philippines	26.6	1.9	26.3	2.0	25.2	2.1	21.6	3.5	(0.3)	(1.1)	(3.6)
Farmers	38.5	2.1	38.0	2.1	38.3	2.5	34.3	3.0	(0.5)	0.2	(4.0)
Fishermen	41.2	4.6	41.3	4.0	39.2	4.7	34.0	5.8	0.1	(2.1)	(5.2)
Children	35.2	1.7	35.3	1.4	35.2	1.7	31.4	1.9	0.1	(0.1)	(3.8)
Self-employed and Unpaid Family Workers	30.6	2.2	29.9	2.0	29.0	2.4	25.0	2.8	(0.8)	(0.9)	(4.0)
Women	25.9	1.9	25.7	1.6	25.6	1.9	22.5	2.1	(0.2)	(0.1)	(3.1)
Youth	21.1	2.2	21.6	1.8	22.3	2.2	19.4	2.4	0.5	0.7	(2.9)
Migrant and Formal Sector Workers	16.0	2.5	16.8	2.1	16.6	2.6	13.4	2.7	0.7	(0.2)	(3.2)
Senior Citizens	16.9	3.1	16.1	2.5	16.2	2.9	13.2	3.1	(0.7)	0.0	(3.0)
Individuals Residing in urban areas	12.6	4.0	12.6	3.3	13.0	4.2	11.5	5.0	(0.0)	0.4	(1.5)

Table 1. Poverty incidence of the Basic Sectors: 2006, 2009, 2012, and 2015

Source: Philippine Statistics Authority (<https://psa.gov.ph/poverty-press-releases>)

World Bank accounted poverty reduction on the increase of employment opportunities, low inflation, and increase in income of the workers. However, underemployment rate remains on 18 percent for over ten years (World Bank, 2017).

On the 2<sup>nd</sup> quarter of 2017, the Philippines reached 6.5 percent growth, an increase from the 6.4 percent in the 1<sup>st</sup> quarter of 2017. With the 6.5 percent economic growth, the Philippines is now ahead of other ASEAN-member countries but is still behind China with 6.9 percent (Dela Paz, 2017). World Bank believes that the country will remain as one of East Asia's top growth performers. With a positive economic outlook, the Duterte administration aims to reach an economic growth of 6.5 to 7.5 percent for 2017 (Dela Paz, 2017; World Bank, 2017).

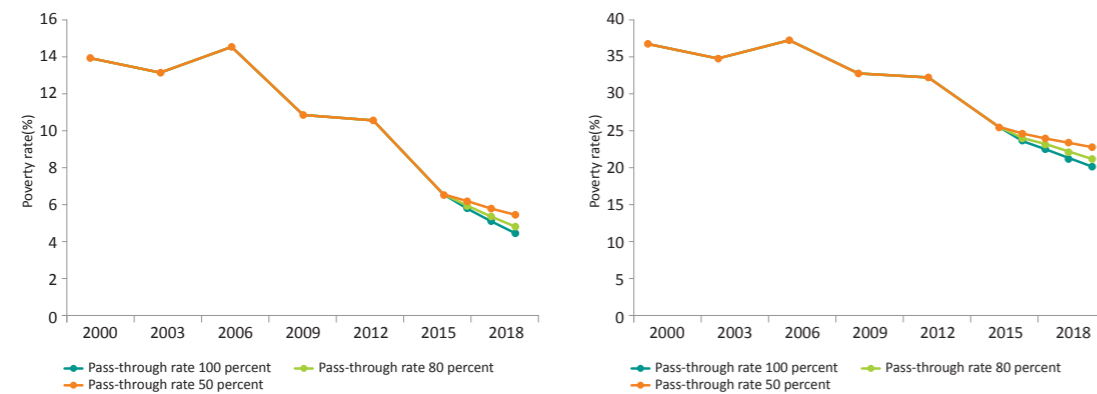
World Bank sees that the country's growth prospects have downside risks in which the value of peso could be weakened by the rise in global interest rates which can further cause domestic inflation. The predicted rise in price of crude oil in the global market can bring inflationary pressures. However, the Philippines can still manage to accelerate its growth and development if it can fully maximize the potential of its young population and continuing the economic efforts that the country is currently doing (World Bank, 2017). Figure 6 shows the annual growth rate of the Philippine GDP from 2012-2016. The highest GDP growth rate of the Philippines was experienced in 2013 but a huge decline (1%) was seen in 2014. In 2016, the Philippines strive to recover its loss, achieving a 6.9% GDP growth.



Figure 6. Growth Rates of Philippine GDP 2012-2016

Source: Asian Development Bank (<https://www.adb.org/countries/philippines/economy#tabs-0-0>)

The strong performances of 2016, and continued policy commitment to the planned increase in public infrastructure spending, are expected to carry the economy's growth momentum over to 2017-2018.



Source: PSA, World Bank staff estimates

Source: PSA, World Bank staff estimates

Figure 7. Actual and Projected Poverty Rates of the Philippines (2000-2018)

Source: Philippines Economic Update April 2017 World Bank Group

In February 2016, the new **Philippine Development Plan 2017-2022** was approved. Globally, it outlines the government's medium-term policy priorities to achieve more inclusive growth. The government is embarking on an ambitious reform agenda to deliver equitable tax reforms, enhance market competition, and improve the ease of doing business, while continuing to sustainably ramp up public investments in infrastructure and social services. Crucial support is being extended to the agriculture sector where the most number of poor are. Emphasis is also given to peace and economic development in the largest province of Mindanao, which includes conflict-affected areas and is the poorest region of the Philippines. It also considers the country's international commitments such as the 2030 Sustainable Development Goals.

## 1) National Production Factors

### a. Institutions

According to the Global Competitiveness Report 2015-2016 published by World Economic Forum, the Philippines' institution was ranked in the **77<sup>th</sup> out of 140 with the score of 3.8 out of 7**. For the property rights and intellectual rights, it was ranked in the **78<sup>th</sup> and 71<sup>th</sup> place out of 140**, respectively. Property rights and intellectual rights play a primordial role as safety devices that ensure economic performance without risking technologies achieved through eco-innovation being stolen or copied. Transparency of government policymaking index seems relatively low compared to other countries that have the same size of economy **with the score of 3.9 marking the 85<sup>th</sup> rank out of 140**.

In other words, in the Philippines, implementation of laws, which protect property and intellectual rights is quite weak. This is aggravated by the government's bureaucracy and related systemic problems.

### b. Human Resources

Philippines' HDI value for 2015 is **0.682**— which put the country in the **medium human development category**—positioning it at **116 out of 188 countries and territories**. Between 1990 and 2015, Philippines' HDI value increased from 0.586 to 0.682 within 25 years, an increase of 16.3 percent as below.

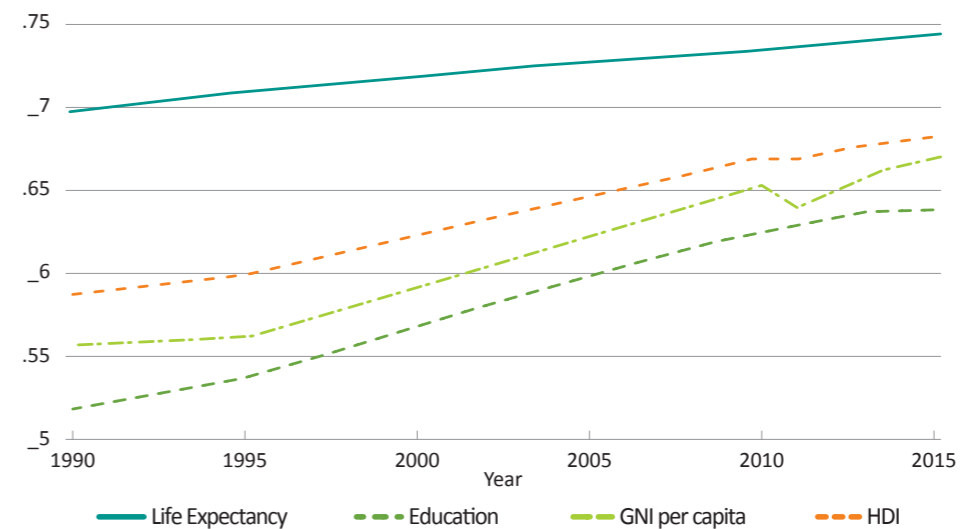


Figure 8. Trends in Philippines' HDI Component Indices 1990-2015

Source: HDI Philippines 2016, UNDP

The ratios for higher education and college education were **84% and 28.2%**, respectively. Quality of math and science education was ranked in the **67<sup>th</sup> place out of 140 (Global Competitiveness Report 2015-2016, WEF)**.

Another major benefit is the Philippines' large English-speaking population. Along with Tagalog, English is the country's official national language. Widespread English fluency reduces the localization challenges that global tech companies face there. It also gives Filipino entrepreneurs the English skills necessary to communicate with the international business community.

#### c. Technology and Innovation

The total expenditure on R&D (%) of the Philippines was found to be very low by marking the rank of 59 out of 63 countries evaluated by IMD in 2017. Business expenditure on R&D per capita also turned out to be very low with the rate of 0.05% in 2016 and 0.08% in 2015 respectively (IMD 2017). In addition, the total R&D personnel per capita were ranked in 55th out of 63 which remains very low. In other words, the overall investment in R&D in the Philippines has tendency to be very weak as abovementioned indicators show clearly.

The ratio of patent application per capita was 0.61 in 2016 and 0.72 in 2017 respectively. The availability of latest technologies was ranked in 78th out of 140; firm-level technology absorption was ranked in 40th out of 140; and the capacity for innovation was ranked in 33rd out of 140 (WEF 2015-2016).

Overall, Filipino's investment in technology development is seen to be quite insignificant while capacity for innovation appears quite high.

#### d. Infrastructure

The quality of overall infrastructure seems very low. Infrastructure, by definition, undergirds a country's socioeconomic development. The more strategically distributed it is – both sectorally and spatially – the better it is for inclusive growth and sustainable development.

With a growing economy, the Philippines could consider better selected infrastructure investments, given its archipelagic landscape, expanding population and rapid urbanization. To support a higher growth trajectory and improve the quality of life in both urban and rural communities, infrastructure development will remain among the top priorities of the government over the medium term. (The Philippine Development Plan 2017-2022)

One of those qualities is a cultural affinity for digital engagement. Filipinos show some of the world's highest levels of online brand engagement, growth in internet penetration, social media account usage, and other indicators of digital uptake. These trends cut across income levels and make the Philippines a promising market for tech companies of all types. Investment in telecommunication is quite high while roads, distribution and ICT sectors are not invested enough.

**Table 2.** Strengths and Weaknesses of Philippine Infrastructures

<Strengths>			<Weaknesses>		
Infrastructure		Rank	Infrastructure		Rank
4.2.19	High-tech exports (%)	1	4.5.05	Pupil-teacher ratio (secondary education)	61
4.2.20	ICT service exports	1	4.5.04	Pupil-teacher ratio (primary education)	60
4.2.03	Mobile Telephone costs	2	4.5.06	Secondary school enrollment	59
4.4.18	Renewable energies (%)	4	4.4.10	Human development index	59
4.5.18	Language skills	18	4.4.05	Life expectancy at birth	59
4.3.19	Value added of KTI industries	23	4.2.07	Computers per capita	59
4.2.12	Qualified engineers	25	4.2.04	Communications technology	59
4.5.16	Management education	25	4.2.05	Connectivity	59
4.5.15	University education	26	4.4.24	Pollution problems	59
4.4.12	Energy intensity	30	4.5.01	Total public expenditure on education	58

Source: IMD\_Competitiveness trends overall\_Philippines 2017

## 2) Market and Corporate Structure

High level of local market competition in the area was observed with the score of 5.2 out of 7, while the extent of market dominance was a quite high level by ranking 87<sup>th</sup> among 140 countries (WEF 2015-2016).

According to the WEF 2015-2016 report, the Philippines ranks 56<sup>th</sup> on the intensity of local competition and among the worst in ASEAN for the extent of market dominance of companies (87<sup>th</sup>) and the effectiveness of anti-monopoly policy (74<sup>th</sup>). Thus, ensuring healthy competition remains a significant challenge. Business sophistication rate is high whereas local supplier quantity and quality are ranked in medium level.

The adoption of the new Competition Act in July 2015 marks the end of over 20 years of legislative discussion over the law and signals the country's readiness to tackle anti-competitive practices and regulatory barriers that dominate business landscape.

But now that the Philippine Competition Act is in place, it remains to be seen how the law will accomplish its much-awaited goal of putting an end to monopolies and cartels that hold Filipinos hostage with inexplicably high prices or poor quality in basic commodities and services.

## C. Environmental Issues

The Philippines is an active party in signing different international treaties that are related to the environment. The Central Intelligence Agency provided a list of environment-related international treaties that the Philippines signed which include the following (CIA, n.d.):

**party to:** Biodiversity, Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Marine Dumping, Ozone Lay-

er Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling; **signed, but not ratified:** Air Pollution-Persistent Organic Pollutants.

As one of the developing countries, the Philippines is facing a problem on rampant land use change to meet the demands of the fast-paced economic growth and development. Farmlands are being converted into subdivisions and residential areas to occupy the continuously growing population in urban areas due to in-migration and rapid urbanization. As a result, instead of carbon dioxide being sequestered with the help of the original vegetation, the changed land area is now contributing to the production of carbon dioxide which continuously affects the environmental condition of the surroundings.

The administration is campaigning for its pro-environment and pro-people agenda. In response to this, the Department of Environment and Natural Resources (DENR) wanted to focus in solving air pollution and solid waste (Simeon, 2017). But there are still efforts in solving issues related to mining and water pollution that are being done. Water and air pollution, solid waste management, and issues on mining are the worst environmental problems that the Philippines is facing.

#### i. Water Pollution

The Philippines is surrounded by different bodies of water and is known for its mega diverse aquatic resources (being situated in the Pacific Coral Triangle). Thousands of Filipinos are fishermen and solely rely on the aquatic resources that the country have. However, due to improper disposal of wastes, the garbage ends up in different bodies of water in the country.

Greenpeace, an international environmental activists' organization, announced the Philippines as the third most plastic polluters of oceans. This can be attributed to the top-three big transnational companies who are selling products that are packaged in single-use plastic containers (Philippine Daily Inquirer, 2017; Philippine Star, 2017). With the current economic situation of the people in the Philippines, the common people cannot buy commodities and other products in large amounts, forcing them to purchase such products in small amounts. With settlements near the bodies of water, it has been observed that domestic waste is usually dumped into the rivers and oceans polluting them severely. The most common example are the Manila and Laguna de Bay – both heavily polluted of garbage. .

To solve water pollution, there are agencies that are conducting clean-up drives to rehabilitate polluted bodies of water. As a matter of fact, thousands volunteered to clean the Manila Bay on the 32<sup>nd</sup> International Coastal Cleanup Day that happened last September 2017 (Pilapil, 2017). Adopt-an-Estero or Adopt-a-water-body Program is also conducted by the Department of Environment and Natural Resources together with different private companies who will adopt garbage-full canals and rehabilitate it by cleaning the *esteros* and planting varied species of plants in its surrounding.

#### ii. Air Pollution

In the last celebration of World Environmental Health Day held last September 26, 2017, the Department of Environment and Natural Resources (DENR), Department of Health (DOH) together with World Health Organization (WHO) of the Philippines publicized the adverse health effect of outdoor and indoor air pollution to the Filipinos (DENR, 2017).

In 2015, DENR Former Secretary Ramon Paje reported a poor air quality amidst efforts of the government to improve the quality of air in its megacities like Metro Manila. It was reported that Metro Manila has an air quality of 125 micrograms per normal cubic meter ( $\mu\text{g}/\text{Ncm}$ ) for Total Suspended Particulates which is above the international standard of 90  $\mu\text{g}/\text{Ncm}$  (Ranada, 2015). An improvement in the air quality of Metro Manila was reported this year (2017) by one of the Bureaus of the DENR, the Environmental Management Bureau. The data were gathered from the 19 Air Quality Monitoring System (AQMS) sites in Metro Manila. The gathered data from these 19 AQMS will be used in monitoring the air quality of the metro and be a basis of policies that will help further improve the quality of air (Bonquin, 2017).

#### iii. Solid Waste Management Issues

As one of the developing countries, one of the problems of the Philippines is the generation of wastes that further degrades the environment resulting to pollution and adverse health effects to people. With the fast-paced urbanization, World Bank projected a rise of 165% in waste generation which is equivalent to 2.2 billion tons per year from 1.3 billion tons in the cities by 2025. The increase in wastes generation in urban areas is being linked to increase of per capita income of urban households (Ng, 2012).

Municipalities and city governments are now beginning to implement total plastic bans in the country to at least reduce the use of plastics in supermarkets and business establishments. Instead of using plastics, they are promoting the use of reusable bags or eco-bags to shoppers. Another effort in reducing the cost of solid waste management is the segregation of wastes at source in which different cities and municipalities in the Philippines are implementing as well.

#### iv. Mining

With the rich natural resource of the Philippines, it is no doubt that the country is one of the major suppliers of variety of minerals in the world. The Philippines is said to be fifth mineral-rich country in the world in terms of gold, nickel, copper, and chromite with an estimated 840 billion USD worth of untapped mineral wealth (Chavez, 2017). With this billion-dollar worth of unmined minerals, a lot of controversies are rising, pinning the mining firms responsible for environmental degradation. During the early months of 2017, the DENR closed 23 mine sites and suspended five others in which the National Competitiveness Council thought to affect the global competitiveness rankings of the country (Mercurio, 2017).

To solve environmental degradation, mining firms have allotted 19.1 billion pesos for their Environmental Protection and Enhancement Programs to rehabilitate the mining sites. Reforestation activities are also done by these mining companies to compensate for the used resources. In December 2015, more than 47,000 hectares of land are reforested by mining companies (Chavez, 2017).



## 2. Eco-innovation Performances in the Philippines

The continuous expansion of economic activities worldwide requires the inexorable exploitation of scarce resources. While there have been efforts to achieve sustainable production, resource efficiency and reduce greenhouse gas (GHG) emissions, offset coming from the activities in other areas that compromise environmental protection for immediate economic gains are still a problem. This picture propels a global alarm over the threat of climate change and the problem on energy security (Brown and Sovacool 2011, and Huntington and Brown, 2003). As a result, environmental sustainability now stands as a vital component of most governments' national agenda. Environmental concerns are thus bound to play a more crucial role in shaping both domestic and international public policy (ASEIC on Eco-innovation, 2011).

The 2017 Global Innovation Index (GII), a tool to evaluate the multi-dimensional features of innovation and in formulating policies to stimulate long-term output growth, productivity and trade, reported that the Philippines ranked 73<sup>rd</sup> among 127 economies in innovation garnering a score of 32.5 out of 100. This is a slight improvement from the score 31.8, ranking 74<sup>th</sup> out of 128 economies in 2016. The country also ranked 5<sup>th</sup> out of the seven members of the Association of Southeast Asian Nations (ASEAN) in the survey, ahead of Cambodia (101<sup>st</sup>) and Indonesia (87<sup>th</sup>), but behind Singapore (7<sup>th</sup>), Malaysia (37<sup>th</sup>), Thailand (51<sup>st</sup>), and Vietnam (47<sup>th</sup>) (see Table below).

Table 3. Global Innovation Index ranking in ASEAN

Over-all Global Innovation Index : ASEAN Ranking					
Country	2013	2014	2015	2016	2017
Singapore	8	7	7	6	7
Malaysia	32	33	32	35	37
Thailand	57	48	55	52	51
Philippines	90	100	83	74	73
Indonesia	85	87	97	88	87
Vietnam	76	71	52	59	47
Brunei Darusalam	74	88	n/a	n/a	71
Cambodia	110	106	91	95	101
Myanmar	n/a	140	138	n/a	n/a

### A. Eco-innovation Performance Analysis

#### i. Strong Performances (Based on 2017 Global Innovation Index Analysis)

Philippines' strongest indicator of innovation is research talent in business enterprise. It is defined as the percentage in an enterprise of researchers "as professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, as well as in the management of these projects".

In 2017, the country ranked 8<sup>th</sup> (75.5 score) in the world, a steep jump from 18/127 last 2015 (65.1 score), belonging to the business sophistication pillar. Also, the country ranked 9<sup>th</sup> in the world in terms of Firms Offering Formal Training indicator with 74.4 score. Still under this pillar, in terms of knowledge absorption, the country garnered 43.8 score, ranked at 25<sup>th</sup>/127 rocketing from 58<sup>th</sup> last year.

Next top indicator coming from knowledge and technology outputs pillar. The country ranked 15<sup>th</sup> (75.4 score) in terms of growth rate of GDP per person engaged, 16<sup>th</sup> in ICT service exports, 18<sup>th</sup> in high-tech and medium high-tech output, 30<sup>th</sup> in knowledge diffusion, 31<sup>st</sup> in knowledge impact, and 33<sup>rd</sup> in foreign direct investment net outflows.

Another strength of the country is market capitalization, under market sophistication pillar. For 2017, the country ranked 17<sup>th</sup> (34.9 score) dejected from 8<sup>th</sup> place last year. Nevertheless, it is still considered as one of the strengths of the country. In terms of trade, competition and market scale, the Philippines ranked at 27<sup>th</sup> (72.9 score) in the world. The country made a steep jump from 104<sup>th</sup> in 2016 to 28<sup>th</sup> in 2017 in terms of domestic market sale which is defined as the domestic market size is measured by gross domestic product (GDP) based on the purchasing-power-parity (PPP) valuation of country GDP, in current international dollar (billions).

Under ecological sustainability indicator of the infrastructure pillar, GDP per unit of energy use is the next strength of the country. Defined as the purchasing power parity gross domestic product (PPP\$ GDP) per kilogram of oil equivalent of energy use, the country ranked 16<sup>th</sup> (50.0 score) in the world.

#### ii. Weak Performances

Generally, the country performed poor in most of the indicators of the seven pillars of innovation. The results could be attributed to low expenditures in Science and Technology Innovation (STI) human capital, research and development (R&D), and weak linkages in the STI ecosystem (based on Philippine Development Plan 2017-2022). The factors behind the weak performance of the STI sector are as follows:

**Weak Science and Technology Innovation (STI) culture.** Various sectors do not recognize, appreciate, and understand the use of technology and science-based information as mean to achieve its respective goals and objectives. Despite its availability, there are reports that the technologies are not widely exploited among micro, small, and medium enterprises (MSMEs) and sectors like agriculture and fisheries. This could be attributed to the lack of awareness on the available

technology outputs (technologies, processes, or services) derived from public R&D activities, and lack of various government incentives to support innovation to further spur its growth. Other reasons could be weak technology transfer between technology generators and users, user's incapability, and inadequate local government unit provision.

**Low government spending on STI.** Investments in R&D are crucial in enhancing the country's innovation environment. STI monitoring and evaluation of expenses on R&D and innovation undertakings, as well as support for human resources development in the field of science and technology (S&T) indicates low government spending. Based on the STI disbursement report, while nominal R&D expenditures increased by 80 percent to P15.92 billion in 2013, the proportion of R&D spending to Gross Domestic Product (GDP) stood at only 0.14 percent. This is substantially below the percent benchmark recommended by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the global average of 2.04 percent. It also performed behind to other ASEAN countries, such as Vietnam (0.19 %), Thailand (0.36%), Malaysia (1.09%), and Singapore (2.0%). The country's relatively low ranking in the GII Report was pulled down by weak human capital and R&D, with a score of 22.7 out of 100, ranking 95<sup>th</sup> (2017 GII Report).

**Inadequate Science and Technology human resources engaged in STI R&D.** As of 2013, the country has a total of 36,517 R&D personnel, of which 26,495 are key researchers (scientific, technological, and engineering personnel), and the rest are technicians and support personnel (Compendium of ST Statistics, 2015). This explains that there are only 270 researchers for every one million Filipinos, which falls short of the UNESCO norm of 380 per million population and the 1,020 researchers (73.53% lower) per million population average across developing economies of East Asia and the Pacific. Of the total researchers in the country from the government, higher educational institutions and private non-profit sectors, 14% have PhDs, 38% have Master's degrees, and 34% have Bachelor of Science (BS) degrees up to post BS degrees. The lower the number of researchers in the country may result to produce graduates outside of Science, Technology, Engineering, and Mathematics (STEM) programs, which are the disciplines where R&D thrives.

**Difficulty in growing employment opportunities and retaining S&T human capital.** An analysis of the country's innovation system conducted by the United States Agency for International Development-Science, Technology, Research and Innovation for Development (USAID-STRIDE) Program revealed that the amount of STEM graduates exceeds local demand. As a result, there is an outmigration and underemployment of skilled, locally-trained scientists and engineers in the country. The report also noted there is limited opportunities in terms of training related to innovation, particularly in information technology.

**Limiting regulations that hamper the implementation of R&D programs and projects.** The bureaucratic government procurement process impedes the immediate acquisition of equipment and other supplies, which in turn delays the implementation of R&D programs and projects. This was reiterated by the USAID-STRIDE study, which shows that restrictive regulations make the procurement of equipment and consumables for research very slow and gratuitously complex. It resulted to slower research productivity, publication potential, and speed to market innovations. In addition, the report says that government research grants do not pay off universities for the

salary of faculty members' research activities. Such practice is rarely seen outside the Philippines.

**Inadequate STI infrastructure.** The country does not have sufficient STI infrastructure such as laboratory amenities, testing facilities, and R&D centers. And those that are existing need upgrading and competitive state of the art. The situation contributes to the less absorptive capacity in research institutions. The USAID-STRIDE report explains that public institutions failed to provide young researchers, particularly those returning from PhD studies abroad with more advanced research agenda, with the necessary equipment.

### 3. On Policy Landscape: Towards Circular Economy in the Country

Philippine policy and legislation provide the overarching framework for the development of circular economy of the country. With the absence of the development of legislation to regulate environmental problems brought about by rapid urbanization and globalization, circular economy would have far less at grip. Green growth policies are of integral part of the structural developments needed to foster competitive, more sustainable and inclusive growth. In achieving circular economy, government regulations should be predictable, consistent and challenging but with realistic targets at the same time. Decoupling economic growth from environmental degradation is one of the main thrusts in achieving its goal (Proceedings on Workshop on Green Policy, 2017).

Green initiatives of the country (transition to green economy) include the integration of sustainable development in the Philippine Development Plan (PDP) 2017-2022, climate lens in evaluating national programs, projects and activities, convergence initiative of national government agencies (NGAs) in implementing national programs and projects i.e. National Climate Change Action Plan, Public-Private Partnerships (PPPs), membership to the Global Green Growth Institute (GGGI) and resource valuation and Environmental and Natural Resource Accounting (ENRA).

Circular economy requires strategic elements to measure economic output and progress. These include energy efficiency, resource efficiency, meeting international production and process standards, fostering innovation, mitigating of conflicts deriving from the overuse of natural resources, attracting foreign investments, natural resources and climate change resilience (Gutterer, 2015).

**Energy Efficiency.** Philippine industry representatives' emphasize that high energy costs adversely affect their competitiveness. By improving the energy efficiency of their operations, companies can respond directly to this problem. An improved energy management does not always correlate with high investment costs in equipment but in many cases it can be attained through the process of optimization. Furthermore, an improved energy efficiency can contribute to the mitigation of GHG-emissions as mitigating measure to combat the adverse effects of climate change.

**Resource Efficiency.** Inflation of raw materials for many industrial sectors is observed to be a constant problem. According to the study of Asian Development Bank (ADB), it is expected that water consumption will be significantly more costly in the near future. By improving business procedures, not only production costs can be reduced but costs for the management of waste, hazardous and toxic waste and as well as waste water.

**Meeting International Production and Process Standards.** Involving in global supply chains and having a good standing on major markets depends highly on good quality product and service delivery. Good quality is the result of well-organized business processes. Well organized business processes are a key for good environmental performance. Hence, good quality and good environmental performance go hand in hand. Along with the introduction of new standards like life-cycle-analyses and the concept of carbon food print, industries are increasingly challenged to establish comprehensive and consistent management systems that need to go beyond certification processes and prove their value in real business performance.

**Fostering Innovation.** The industry of the Philippines acknowledges that enhance the value chain and a specialization in higher quality products are keys for successfully doing business in the future. Innovation increasingly occurred within a common field of action between companies and research institutes, within industry clusters and/or along global value chains. Like for the design of green products and processes, companies need to enhance capacities to interact with stakeholders in a creative manner and be proactive in innovation processes.

**Mitigating of Conflicts Deriving from the Overuse of Natural Resources.** Promotion of Green Economic Development Project (ProGED) reported that one of the problems by some industries is access to natural resources such as clean water. And some industries are blamed by the public, NGOs, and communities for an overuse of natural resources resulting in a significant threat for its license-to-operate. Companies need to redefine and change their roles within society as corporate citizens. Capacity building is needed to communicate with different stakeholders in order to find adequate solutions for mitigating business risks.

**Attracting Foreign Investments, Natural Resources and Climate Change Resilience.** The Philippine industry recognizes foreign investments as a key to strengthen its competitiveness. In this setting, it is viewed that it is not only capital but the transfer of technology and knowledge are of interest. Assessment of risk management and governance is mandatory for an increasing number of companies. Natural disaster impacts as occurred in the Philippines in 2013 have resulted in major disturbances for product delivery and for supply chains. Since the Philippines is one of those most prone countries to climate change, foreign investors assess the vulnerability of production sites and infrastructure regarding flooding or typhoons. In a common effort between local governments, public shareholders and the private sector, the resilience of production sites has to be significantly be strengthened.

Table 4. Planning Instrument for Eco-innovation Policy

National Plan and Strategy		Sector						International Support
Sustainability	Eco-innovation	I	II	III	IV	V	VI	
Philippine Development Plan 2017-2022	Legislative Agenda to Leverage Science, Technology, and Innovation, 2017-2022	+	+	+	-	+	+	World Bank, Asian Development Bank (ADB), JAICA and technical assistance for tax reform and spending plan
	Strategic Framework to Leverage Science, Technology, and Innovation 2017-2022	+	+	+	-	+	+	
	The enactment of Republic Act (RA No. 10667) or the Philippine Competition Act (PCA) of 2015	-	-	+	+	+	-	
	Green Jobs Act (RA 10771 of 2916)	+	+	+	+	+	+	
	Biofuel Act (RA 9367)	-	-	+	-	-	-	
Philippine National Climate Change Action Plan: 2011-2028		+	-	-	-	-	+	-
10-year Solid Waste Management Plan thru RA 9003 Ecological Solid Waste Management Act of 2000		+	+	-	-	-	-	-
Philippine Energy Plan 2012 - 2030		+	-	+	-	-	-	Participation of Private sector
Sustainable Development Goal (SDG): UNDP in Philippines		+	+	+	+	+	+	-
	Greening the Manufacturing Industry Roadmap 2016-2030:							German Federal Ministry for Economic Cooperation and Development (BMZ) and Gesellschaft für Internationale Zusammenarbeit (GIZ)
	1. The Auto Manufacturer and the Auto Parts Industry	+	+	+	+	+	+	
	2. Pulp and Paper Industry							
	3. Plastic Industry							
	4. Housing Industry							
	5. Furniture Industry							
	6. Copper Industry							
	National Eco-tourism Strategy and Action Plan 2013-2022	+	+	-	-	-	-	-

I: Environmental protection and management; II: Waste; III: Renewable energy; IV: Purchase/ Procurement; V: Clean technology; VI: Climate change; "+": recognizable; "-": not recognizable.



Enabling policies towards circular economy are its prerequisites. However, the occasion for an effective transition is significantly augmented by national and regional governmental policy that will facilitate positive economic change. Currently, the Philippines, among others, are the implementing environmental laws and regulations in achieving a resource-efficient economy hereto are:

- RA 8749, Clean Air Act
- RA 9003 Ecological Solid Waste Management Act
- RA 9275 Clean Water Act
- RA 6969 Toxic Substances and Hazardous and Nuclear Waste Control Act of 1990
- RA 9501 Act to Promote Entrepreneurship Strengthening Development and Assistance Programs to MSME, amending RA 6977, otherwise known as the Magna Carta for Small Enterprises
- RA 4109 Charter of Bureau of Product Standards
- RA 9512 Environmental Awareness and Education Act of 2008.
- RA 9513 Renewable Energies Renewable Energy Act
- RA 9729 Climate Change Act
- PD 1586 Environmental Impact Statement System • Ratification of UNFCCC by the Senate of the Philippines (1994)
- Kyoto Protocol signed by the Government of the Philippines (1998)
- National Framework Strategy on Climate Change, 2010 - 2022
- The Philippine Strategy for Climate Change Adaptation, 2010 - 2022
- AO 171 - the Presidential Task Force on Climate Change (PTFCC) with DENR as Secretariat and IACCC as its technical arm.
- AO 171 - the PTFCC based at DOE and chaired by the DOE Secretary
- AO 2003-14 the Philippine Environment Partnership Program (PEPP) is a DENR partnership program with industries, in cooperation with the other environment related agencies, aimed to support industry self-regulation towards improved environmental performance.
- DENR Special Order 2007-653 - the Advisory Council on Climate Change Mitigation, Adaptation and Communication; served as a technical arm of the PTFCC
- EO 301 - "Establishing a Green Procurement Program for All Departments, Bureaus, Offices and Agencies of the Executive Branch of Government
- EO 774 - PTFCC and various Task Groups on Climate Change
- EO 785 - PTFCC to develop the National Climate Change Framework; effectively coalesced the old PTFCC and the PAGWCC into the new PTFCC
- SO 2006-787 - the Inter-Agency Working Group (IAWG) and a Program Steering Committee for the Adaptation to Climate Change
- SO 2006-788 - DENR representation to the Inter-Agency Committee on Climate Change RA 9367

## 4. Selected Circular Economy and Eco-Innovation Areas and New Trends

The Promotion of Green Economic Development (ProGED) program is a three-year initiative with the Philippines Department of Trade and Industry- Regional Operations Group (DTI-ROG) as the lead agency, and in partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the German international development cooperation agency. Concluded in the year 2016, it aimed at increasing the participation of more than 450 registered micro, small or medium-sized enterprises (MSMEs) in 19 provinces with initial focus on the tourism sector due to its linkages to upstream and downstream industries.

The program aims to contribute in the economic development of the country through implementing environmentally friendly, climate-sensitive and inclusive strategies and measures. The pilot project began in 2013 in the provinces of Cebu and Bohol. In cooperation with the DTI it scaled up to 17 further provinces, and added with another four in 2016 among which were in Pampanga, Tarlac, Laguna, Cavite, Palawan, Occidental Mindoro, Albay, Camarines Sur, Negros Occidental, Capiz, Negros Oriental, Siquijor, Agusan del Norte and Surigao del Norte.

MSMES identified for the project were mostly resorts, hotels, health and wellness establishments, restaurants, gifts, toys and houseware sector and food sector. It operated in three intervention lines (Fig. 11): 1) information awareness raising on green economic development; 2) business promotion and matchmaking, and 3) green policy framework for the DTI. Some approaches employed were multi-level through the creation of favorable political and economic framework conditions in the national level while ensuring the impacts on the local level, and the innovative approaches of greening the value chain and establishing climate smart locations combined with Market System Development approach. Among the notable accomplishments which mostly surpassed its targets as reported by GIZ in February 2016 included:

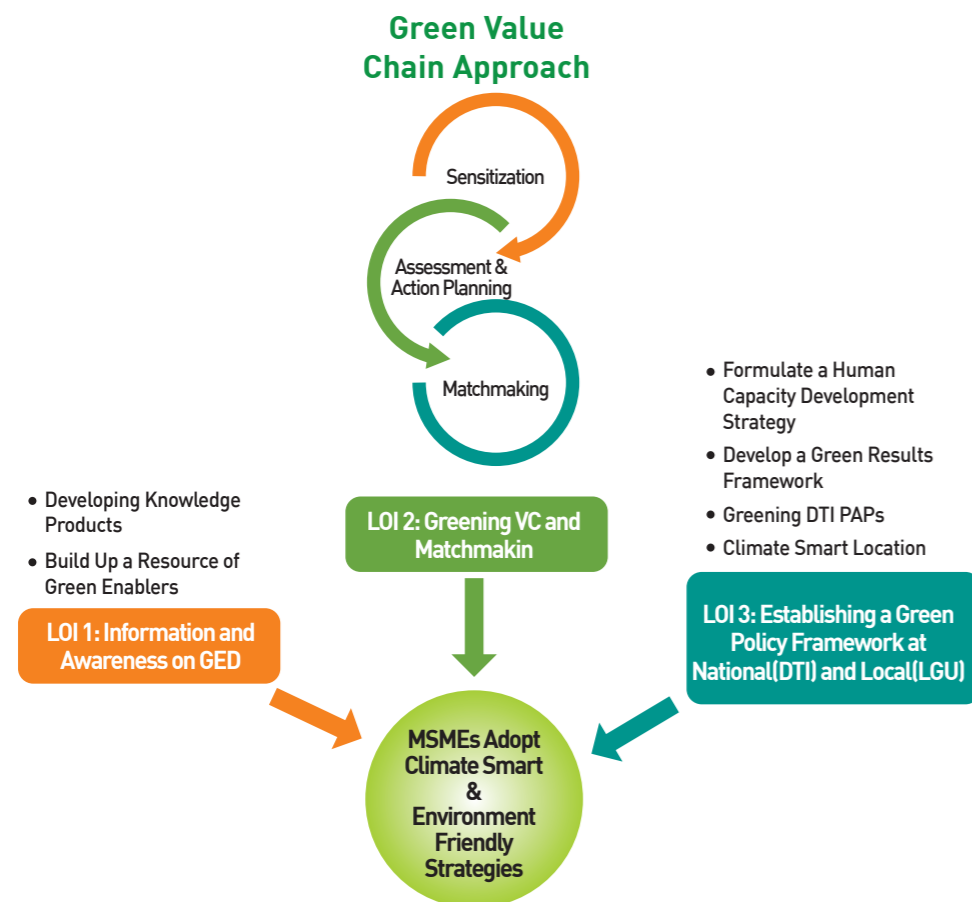
- *Intervention 1:* 66 awarded green MSMEs (as of 2015); 66 green MSMEs publicly recognized, and 12 654 people participating in GED sensitization events.
- *Intervention 2:* 458 MSMEs greening their operations with Siargao del Norte having the most number of green industries, and 364 MSMEs availing green business development services and/or adopting green technologies (e.g. LED lights, solar technology, and biosolun technology).
- *Intervention 3:* 32 GED related subnational resolutions with Bohol having the highest resolutions



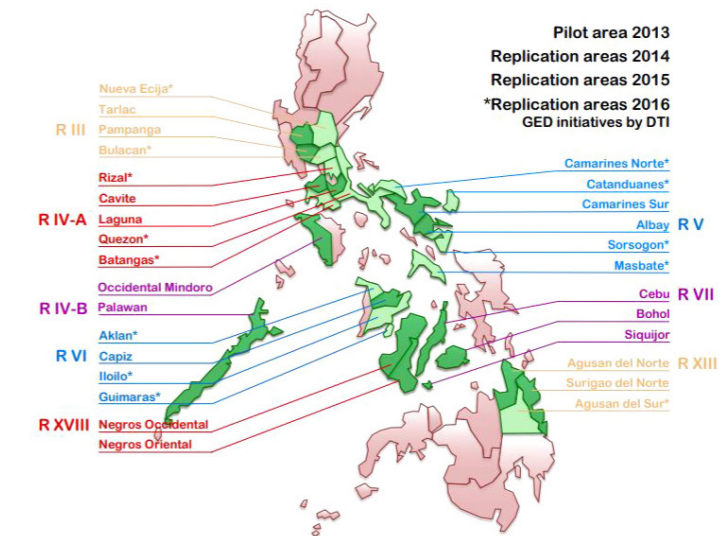
passed; 1 climate smart location concept note prepared, and 3 subnational resolutions submitted to the national level.

Among the positive results likewise attributed to the impacts of adopting the GED initiatives were as follows:

- Lowered production costs and increased sales of the enterprises after adopting green practices in the areas of energy efficiency, solid waste management and locally sourced, environmentally friendly supplies, among others;
- In the tourism, manufacturing and retail sectors, 66 enterprises have gained accolades for their greening efforts, including five that have received the prestigious ASEAN Green Hotel Award
- DTI has established a Green Growth Core Group, composed of management staff from various departments, which is responsible for policy-level steering of the green economic development initiatives



**Figure 9.** Three intervention lines as a green value chain approach in increasing green development awareness of MSME.



**Figure 10.** Areas covered in the project (ProGED) implementation

An offshoot of the ProGED program, the green development of the Philippine manufacturing industry plan is envisioned to be transformational aimed to strengthen the systematic competitiveness of the country while foster inclusive growth. Rationale for taking further paths of the green initiatives are the call for collective environmentally sound action indicated in Leader's Declaration G7 Summit and COP 21 calling for the decarbonisation of the global economy by global response, as well as the four Sustainable Development Goals. The industry roadmap published by the GIZ in 2015 is a three-staged comprehensive green industry modernization plan (Fig. 11). By 2017, capacitating the Philippine industries is the main focus. By 2022, the strong green industry sector is aimed to enter the ASEAN market as well as envisioned to account to: 80 per cent of the exporting companies; 60 per cent of companies with more than 100 employees operate in an integrated quality/environment/energy management system, and 100 per cent of listed companies and 30 per cent of companies with more than 100 employees operate in compliance to foreign investments standards. By 2030, the Philippine shall be known for its green innovation capacity and 100 per cent of the housing schemes complying with latest environmental standards. This initiative that employed the value chain approach in assisting 18 Philippines provinces in adopting climate smart operations in their enterprises is. For efficient implementation and fulfillment of the road map, the modernization strategies are divided into six manufacturing industries, namely: automotive and autoparts, paper, plastic, housing, furniture, and copper. Partnerships among various sectors are necessitated of which the major players are DTI and GIZ. Identified integral elements in strengthening the Philippine industries include:

1. designing incentive mechanisms;
2. revising incentive/subsidy schemes;
3. giving a boost to the development of a green industry and service sector;
4. launching a green productivity initiative in cooperation with industry;
5. fostering green innovation on the national, regional, and international level;
6. facilitating international B2B cooperation for technology and knowledge transfer;

7. promotion of the Philippines as climate change resilient and environmentally sound production and service delivery location;
8. encouraging a green job initiative;
9. elaborate a long-term strategy to give coherent signals to the private sector, and
10. shaping a consistent framework for promoting green economic development.

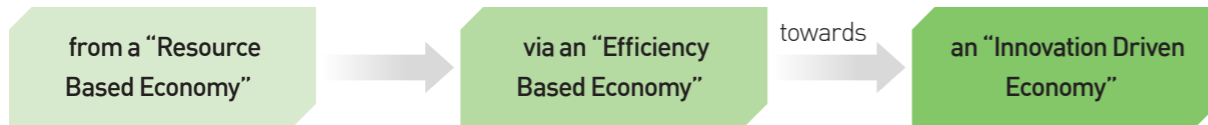


Figure 11. Three-stage model for comprehensive green modernization plan

Another major player in strengthening the country towards developing products and processes that are innovative and sustainable is the DTI-Philippines Economic Zone Authority (PEZA). PEZA was created under Republic Act No 7915 or otherwise known as “The Special Economic Zone Act of 1995” which is the reinforcement of the Philippine government’s efforts on investment promotion, employment creation, and export generation. Basically, PEZA overtook the functions of the former Export Processing Zone Authority in 1995 which transferred as well the development of economic zones from PEZA to the private sector. Its primary goal is to provide a globally competitive environment for investments. It is mandated to oversee and administer incentives to developers/operators of and locators in world-class, ready-to-occupy, environment-friendly, secured and competitively priced Special Economic Zones. A green economic zone is likened to an eco-industrial park (EIP), wherein businesses cooperate with each other and with the local community, in an attempt to reduce waste and pollution, efficiently share resources (such as information, materials, water, energy, infrastructure, and natural resources), and help achieve sustainable development, with the intention of increasing economic gains and improving environmental quality. An EIP may also be planned, designed, and built in such a way that it makes it easier for businesses to cooperate, and that results in a more financially sound, environmentally friendly project for the developer.

Economic Zones are eligible to a wide variety of privileges and incentives including the following: *a) Fiscal Incentives:* Income tax holiday of specific duration (4 years, 6 years, 3 years), and subject to extension under certain conditions; 5 per cent special income tax upon expiration of the income tax holiday. 5 per cent is based on the defined gross income where only specific enumerated expenses are deductible from gross sales or gross receipts; tax and duty free importation; 0 per cent value added tax on purchases of goods and services for use in the registered activity. *b) Non-fiscal Incentives-* Simplified Import – Export Procedures; Employment of Foreign Nationals in supervisory, technical or advisory positions; Special Non-Immigrant Visa to certain officers and employees

All over the country, as of October 2016, PEZA administers 73 Manufacturing Economic Zone, 243 Information Parks/Centers, 21 Agro-Industrial Economic Zone, 19 Tourism Economic Zones, and 2 Medical Tourism Parks/Centers. These PEZA-registered economic zones are situated in Baguio, Bataan, Cavite, Laguna, and Mactan, among others. Of these economic zones, only four are owned by PEZA while the rest are from the private sector. PEZA highly encouraged the development of eco-

zones which are expected to increase considering that there are 29 Manufacturing Economic Zone, 104 Information Technology Parks/Centers, 6 Agro-Industrial Economic Zone, and 6 Tourism Economic Zone still being developed as of July 2016.



Figure 12. Operating economic zones in the Philippines

Sustainable Integrated Area Development (SIAD) and participatory environmental governance will be an overarching principle in implementing the various strategies to achieve the outcomes. SIAD will be adopted to address ecological, economic, political, cultural, societal, human, and spiritual challenges and opportunities in a specific area. It will be implemented in an integrated manner to ensure social justice and in order to improve the quality of life of the people. Specific subsector strategies consider CC and DRRM actions, and they are discussed in the succeeding sections.

As to the new trends in Circular Economy and Eco-Innovation Areas, the following are some of the approaches:

### 1.) Employing the multilevel approach in soliciting support and participation of key players at the micro and macro level

Recent initiatives and policies frame the cross-level strategies in greening the Philippine industries, in particular, necessitating a degree of considerations of the conditions on all levels - national, re-



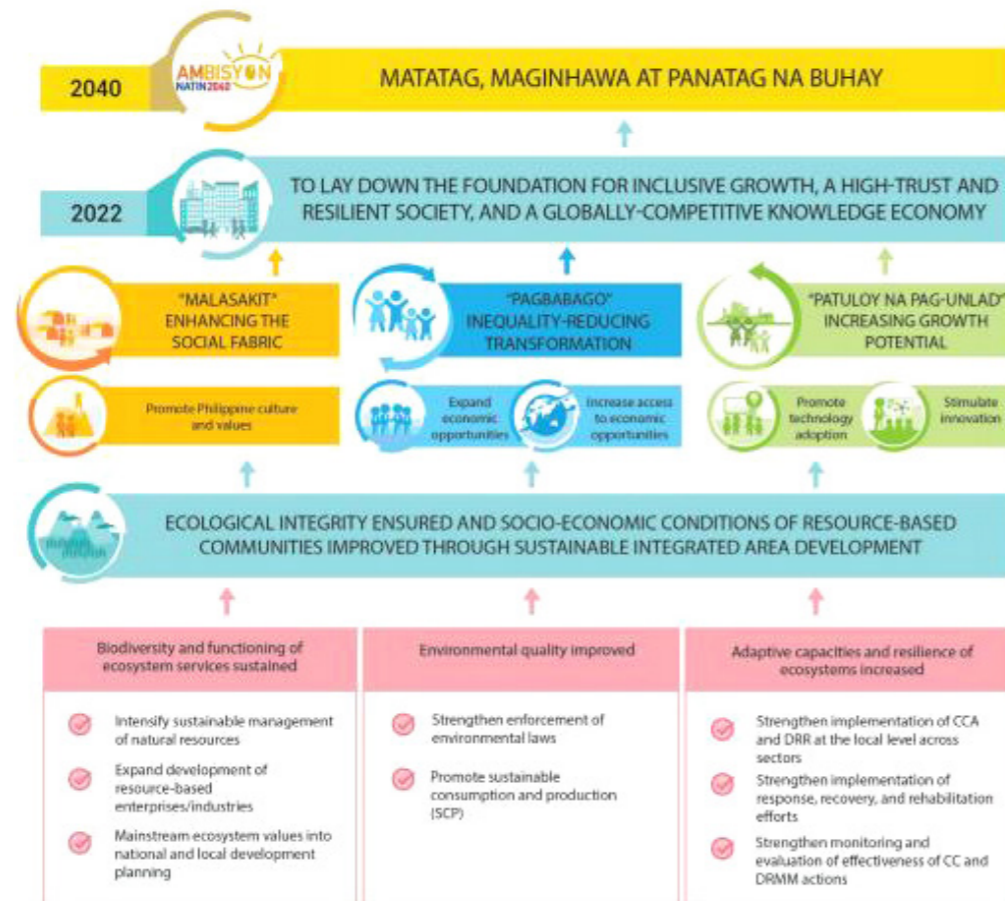


Figure 13. Strategy framework to ensure ecological integrity, clean and healthy environment, 2017-2022 (NEDA, 2017)

gional, provincial, and community. If properly mapped out, the multi-level framework can mobilize key players within their order and eventually influence the transitional and inclusive development. Experiences of the ProGED and PEZA as well as the economic blueprint of the country comprehensively in the Philippine Development Plan 2017-2022 indicate that soliciting the support and representation of the micro and macro levels in conjunction to the stages (i.e. planning, implementation, and evaluation) of the greening process of the economy. On one hand, clustering players has limitations of which some could be: initializing each step becomes chronic; conflicting ideologies and visions; increased managerial and administrative staff, and increased costs.

## 2.) Responsibility shifting from the government to the private sector

Known as Public-Private Partnership (PPP), the mindset and practice shift from saturating the government in terms of the responsibility in establishing a circular economy towards becoming more inclusive, participatory, and proactive private in this initiative of strengthening the industry sector. In particular, the opportunities this approach offers include removing the bottlenecks in creating sustainable green industries especially in investing in initiatives forwarding this cause. Likewise, this approach allows the undertaking of business venture more conducive for the private sectors to

participate in the construction and operation of the industries by which they can introduce technology and innovation in catering better public services. This approach is explicitly beneficial in assisting the government in infrastructures funding gap which is one of the core elements in establishing the green economy. However, PPP has its own potential risks such as higher costs (i.e. developing, bidding, and ongoing), legal and regularity framework complexities, and political social challenges, among others.

## 3.) Participatory environmental governance as a framework managing and integrating all approaches in developing circular economy

Gearing towards developing the proliferation and culture of eco-innovation require action and involvement of multiple sectors. In such multi-dimensional, complicated system operation, driving the players towards a single goal necessitates legislation the very least. In this case, the government's intervention and power in forwarding its thrusts in relation to ecological sustainability of its economic activities and with the support and participation of all the other key players are crucial elements. This particularly rings true in environmental initiatives where an ecosystem level mobilization of the whole state and its instrumentalities is indispensable in producing significant results. Hence, for the Philippine government aligns and frames its policies and programs where collective action is imperative is in conjunction to the capacity of this body to mobilize and strengthen the approaches towards green industries. Meanwhile, failure to implement in its true form the approaches constituting the governance framework has high likelihood of weakening the whole plan or program especially on the aspect that on the ground implementers re-interpret the guidelines in implementing the plan or program to realign on their personal stakes in the field.

# 5. On Barriers and Drives to Circular Economy and Eco-Innovation Areas and Eco-Innovation in the Country

The topmost challenge for strengthening the sustainability of the green industry is primarily the cost barrier which is understandably a substantial consideration for a Third World Country like the Philippines. Expenditures are expected to skyrocket in shifting to green ventures as additional costs will be

incurred from acquiring the technologies in modifying the processes, and approaches to develop ecologically sustainable zones.

Questions involving the win-win proposition of protecting the environment alongside the course of wealth creation seem to increase hesitation among skeptics. In the Philippines, the high cost is much of a high price to bear. For instance, the Department of Transportation (DOTr), the lead agency to implement the Public Utility Vehicle (PUV) Modernization Program in 2018 aims to “implement a transition from current vehicles to high-quality public transit requisites” (DOTr 2017) through the program. Much of the call for the transportation shift is established towards creating a clean, safe, and enjoyable public vehicle riding. However, among the pronounced concerns that the PUV sector addressed which they even demonstrated through a nationwide strike are on the expensive models of the new vehicles. Although the guidelines already provided the schemes in easing out the financial burden with the operators and drivers acquisition of new vehicles, the phaseout plan of old models is likely putting their investments at hand in waste. This case is among the reality for the hampered transitioning of the country towards going into ecological industries.

Institutional instruments are also a challenge in implementing green initiatives in the country. Identified instruments are economic, informational, and plan. The incompatibility of most of the existing policies with the green initiatives delays the full capacities to operate these instruments. One case on point necessitating intervention is the implementation of the Green Building Code (Presidential Decree No. 1096) launched in June 2015. Unfortunately, the scope of the law excludes those edifices constructed earlier than its effectivity. As such, the chronic unsustainable problems existing previously are still present and could impact the little progress recent green initiatives have started.

For the green manufacturing industries, the identified challenges that must be addressed in furthering this initiative are as follow:

- complying with international product and process standards
- strengthening its capacity to innovate respectively to provide innovative services and products
- further developing its business models
- anticipating market developments, client preferences and developments of the regulatory framework
- relevant for domestic and international markets
- increasing significantly its productivity, correspondingly its cost performance
- responding to requests of society
- (pro)actively incorporating emerging and existing risks such as risks of a changing natural environment and climate change.

The following are some of the concrete cases of Eco-Innovation in the country:

### I. *Net-Works Program: Success in Fish Net Recycling*

A collaboration between the global carpet tile manufacturer Interface, Inc. and the Zoological Society of London, the Net-Works Program is “an innovative, cross-sector initiative designed to tackle the growing environmental problem” (Interface 2017) that explore ways to help and empower people in coastal communities through employing local-based conservation. Removing the mentality and practice of donor dependency is also one of the values the initiative targets. The collaboration was created in accordance to Interface’s Mission Zero philosophy of eliminating the adverse impacts to the environment of manufacturing while incorporating social values to their core concept by 2020.

The Net-Works program is a holistic, sustainable approach of carpet tile supply chain replicable in other communities. The program allows the buying of discarded fishing nets dumped on beaches into the sea of some of the poorest rural areas in the central Philippines where sustainable solid waste management is not accessible and undermine the conservation efforts. The program is implemented in different areas including the Danajon Bank, one of only six double-barrier reefs in the world, and the nearby Bantayan Islands. As of March 2015, 61,845 kg of discarded fishing nets, equivalent to a fishing net length of 57,515 km, have been collected from the 14 pilot sites in Danajon Bank and the Bantayan Islands at an average rate of 3,000 kg of nets per month. The income from the export and sale of these nets is used to maintain the community based supply chain.

Moreover, since its creation, among its noteworthy accomplishments are:

- 142 metric tons of discarded fishing nets collected for recycling
- 36 participating communities
- 1,500 families with better access to finance through community banks
- 62,000 people benefitting from a healthier environment
- 66 local community banks set up to facilitate savings and loans
- 2/3 of community bank members are women
- 84% of community banks have an environment fund which invests money in local conservation projects

### II. *Rubber Wastes Becomes Sole and Flooring Materials*

An online social enterprise, Manila Sole supplies high quality men’s footwear made from recycled rubber tires and conveyor belts. Recently, they add local textiles from Baguio and Mindanao. The founders of the social enterprise recognized the increasing problem caused by the exponential stacking up of discarded rubbers. Previous methods of recycling used rubbers as weights preventing roofs from flying have caused another problem since it can collect water and serve as breeding ground for mosquitoes and diseases. Thus, creating a new product with more cost efficient and sustainable production while at the same time fashionable becomes a vision for the enterprise. Local *magbobote* or those people who depend on collecting scrap materials for a living supplies them with their production needs.



Meanwhile, the piling up of rubber waste from their shoe production becomes a challenge for THE Philippine shoemaker Company J. Previously, they discarded 20 kilograms on a daily basis and another 4 tons of rubber waste was generated in Liliw where 200 shoemakers were confronted with the same problem. As a collective effort of mitigating pollution, they created a joint management through profit model of rubber recyclings. Since most are cottage industries, they collaborated with other agencies such as the Department of Trade and Industry with its Share Service Facility Program that allows them to have plastic densifier, a machine used for turning shoe rubber into shockproof rubber flooring on community basketball courts.

### III. *Special Economic Zones in the Philippines*

The investment promotion and incentive granting of the Department of Trade and Industry created the Philippine Economic Zone Authority (PEZA) which then overtook the functions of the former Export Processing Zone Authority (EPZA) in 1995. The transition has led to dramatic improvements as shown in Figure 12 in the investment climate in the country as PEZA is the only cited among the economic zones worldwide (De Lima 2012). It also considerably diversified the nature of the industries generating income.

Having one of the most enormous biodiversity in the world, conservation and protection of its resources through sustainable tourism is an indispensable green initiative for tourism-based wealth generation under PEZA. Included in the guidelines for declaring ecotourism zone is the Environmental Compliance Certificate issued by the Department of Environmental and Natural Resources / Environmental Management Bureau (DENR / EMB). Additionally, Memorandum Circular No. 2017-037 stated the deliberate inclusion of green criteria in greening the economic zones which then aims to “seek to transform business as usual to sustainable practices that will eventually be espoused as the competitive advantage of the Philippine economic zone”. This is in line with the Paris Agreement. Currently, there are 19 operating tourism economic zone most of which are situated in the capital region. Included are innovative PEZA registered ecozone, to name a few are Newport City CyberTourism Zone (NCCTZ) in the National Capital Region, Green Ecotourism Ecozone- Pangulasian (GEEP) in Region IV, and Boracay Eco-Village Resort (BEVR) in Region VI. Green growth is also projected to increase in the Metropolitan Cebu where 17 ecozones in Bogo City, Cordova, Toledo City, Minglanilla, Carcar City, and Dumanjug are eyed to be in full operations if the proposal will be approved.

Besides the eco-innovation approach employed in the tourism sector, recycling and treating of toxic and hazardous waste of industrial wastes is also a special feature of an ecozone. According to Section 5 of the Special Economic Zone Act of 1995 and Rule XXIV, each ecozone shall establish and adopt a sound waste management program so as using a closed loop recycling strategy. As of September 2014, there are 14 establishments operating for collection, management, and recycling of wastes generated by the PEZA/BOI enterprises and to other non-PEZA enterprises all over the Philippines. Companies such as Cleanway Management Solutions Inc., Petromine (M) Sdn. Bhd., and Ohgitani Philippines, Inc. all have state-of-the-art facilities to provide green solutions and dedicated in managing the residuals of industries within the ecozones for a clean, healthy, and sustainable environment.

- CLEANAWAY PHILIPPINES INC.- To engage in the operation of an integrated hazardous waste

management facility consisting of a fenced facility with a secure sanitary landfill, a waste water treatment facility, a staging area for bioremediation, a laboratory and warehouse among others

- OHGITANI PHILIPPINES INC.- Recovery of non-ferrous metal scrap from solid hazardous waste for exportation
- PETROMINE (M) SDN. BHD- Recycling of neodymium, cobalt, nickel and rare industrial metal wastes

### Major Actors (Drivers) in the Philippines (Eco-innovation)

The Department of Trade and Industry (DTI) is responsible for realizing the country’s goal of globally competitive and innovative industry and services sector that contribute to inclusive growth and employment generation.

- The Philippine Board of Investments (BOI), an attached agency of the Department of Trade and Industry (DTI), is the lead government agency responsible for the promotion of investments in the Philippines. Taking the lead in the promotion of investments, BOI assists domestic and foreign investors to venture and prosper in desirable areas of economic activities.
- The Bureau of Product Standards (BPS) of DTI formulates Philippine National Standards (PNS) or adopts relevant international or foreign standards to help industries produce quality products or services and raise productivity. These standards not only protect the consumers but also facilitate trade in the global market. Some of these include the family of international standards on Quality Management System (ISO 9000) and Environmental Management System (ISO 14000).
- The Bureau of Small and Medium Enterprises Development (BSMED) is attached to DTI and is mandated to promote and develop micro, small and medium enterprises (MSMEs) in the country. It initiates and implements programs and projects addressing specific MSME needs in technology development and transfer, financing, marketing and training, and market promotion through trade fairs.
- The Investment Promotion Agencies (IPA) have - aside from BOI and PEZA - a network of IPAs across the country, including: CDC – Clark Development Corporation (CEZ – Clark Economic Zone) and SBMA – Subic Bay Metropolitan Administration (SEZ – Subic Special Economic and Freeport Zone).
- The Philippine Economic Zone Authority (PEZA) is tasked to promote investments, extend assistance, register, grant incentives to and facilitate the business operations of investors in export-oriented manufacturing and service facilities inside selected areas throughout the country proclaimed by the 17This list gives an overview on government agencies that are relevant for the establishment of a GED from the public side. As indicated above specific initiatives and programs have to be identified through a consultation process and implemented – if needed - within a common action framework Greening the Philippine Manufacturing Industry Roadmap Strengthening systemic competitiveness and fostering inclusive growth 20 President of the Philippines as PEZA Special Economic Zones.

The Climate Change Commission (CCC) was created under the Office of the President. The CCC is the lead policy making body of the government tasked to coordinate, monitor and evaluate government programs and ensure mainstreaming of climate change in national, local, and sectoral development plans towards a climate resilient and climate-smart Philippines.

- The Commission on Higher Education (CHED) is the key leader of the Philippine Higher Education System effectively working in partnership with other major higher education stakeholders in building the country's human capital and innovation capacity.
- The Department of Energy (DEO) is mandated to prepare, integrate, coordinate, supervise, and control all plans, programs, projects and activities of the Government relative to energy exploration, development, utilization, distribution, and conservation.
- The Department of Environment and Natural Resources (DENR) is responsible for the conservation, management, development, and proper use of the country's environment and natural resources, specifically forest and grazing lands, mineral resources, including those in reservation and watershed areas, and lands of public domain, as well as the licensing and regulation of all natural resources as may be provided for by law.
- The Climate Change Office (CCO) was created under the DENR Administrative order 2009-04 and serves as the coordinating mechanism internally among the DENR offices as well as externally, with other national government agencies, non-government organizations and local government units on matters related to climate change.
- The Environmental Management Bureau (EMB) is mandated to formulate plans and policies and set appropriate environmental quality standards (water, air and noise) for the prevention, control of pollution and protection of the environment.
- The Philippine Environment Partnership Program (PEPP) pursuant to DENR Administrative Order 2003-14 is a DENR partnership program with industries, in cooperation with the other environment related agencies, aimed to support industry self-regulation towards improved environmental performance. The PEPP seeks to provide a package of incentives and reward mechanisms to industries in effective voluntary self-regulation and improved environmental performance.
- The Department of Finance (DOF) formulates revenue policies that will ensure funding of critical government programs that promote welfare and accelerate economic growth and stability.
- The Department of Interior and Local Government (DILG) establishes and prescribes rules, regulations, implementing laws on public order and safety, the general supervision over Local Government Units (LGU) and the promotion of local autonomy and community empowerment and monitor compliance thereof. Among others, DILG formulates plans, policies and programs which will meet local emergencies arising from natural and man-made disasters.
- The Department of Labor and Employment (DOLE) is mandated to formulate policies, implement programs and serve as the policy-coordinating arm of the Executive Branch in the field of labor and employment.
- The Department of Science and Technology (DOST) is mandated to provide central direction, leadership and coordination of scientific and technological efforts and ensure that the results therefrom are geared and utilized in areas of maximum economic and social benefits for the people.

- The Local Government Units (LGU) are mandated to formulate and implement local programs and enforce local regulations that are – among others - supportive of green objectives.
- The National Economic and Development Authority (NEDA) is mandated to coordinate the development planning and policy formulation process, in order to achieve the objectives of sustainable economic growth coupled with an equitable distribution of income and wealth.
- The Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) is tasked to develop national competence in research and development in strategic areas of industry, energy and emerging technology sectors in the country. Its priority sectors include alternative sources of energy, energy efficiency, renewable energy climate change adaptation, and other environmental issues.
- The Technical Education and Skills Development Authority (TESDA) is asked to manage and supervise technical education and skills development (TESD) in the Philippines.

## 6. Analysis on eco-innovation using 2017 ASEI

The indices used in the 2017 overview of Philippines are useful in representing the existing condition of eco-innovation in the country. It mirrors the present location of the country, in pursuit of a green economy towards sustainable development.

Based on the representative indicators and available secondary data, the Philippines has a lot of margin for improvement. A series of figures below illustrate the performance of the country with respect to past performance. By looking at the 2017 ASEM Eco-Innovation Index, the country appears to be performing poorly. The lack of available empirical data is attributed to this rating. Moreover, it is important to take note that there are undocumented expressions of eco-innovation that were not captured in the pre-determined indices and institutional records.

At the national scale, the concept of eco-innovation is yet to be mainstreamed in the normal discourse. Upon successfully making this concept a household catchphrase, it can be interpolated that the Philippines can sustain its efforts in pursuing green economy.

Below are the specific disaggregated determinants of country performance for eco-innovation:

■ Overview of Philippines' Eco-Innovation using ASEI

- According to the analysis of Philippines' eco-innovation using ASEI, Philippines performed generally very low in every sector recording half of the average score of ASEM countries except for eco-innovation performance which scored 0.55 slightly higher than 0.54, the average of ASEM countries in 2016
- As far as eco-innovation capacity concerned, there was a slight decrease from 0.15 to 0.14 in 2014. Eco-innovation supporting environment also showed a decreasing tendency recording 0.19, 0.22, 0.16 respectively between 2014 and 2016. More efforts for improvement in eco-innovation supporting environment seem needed.

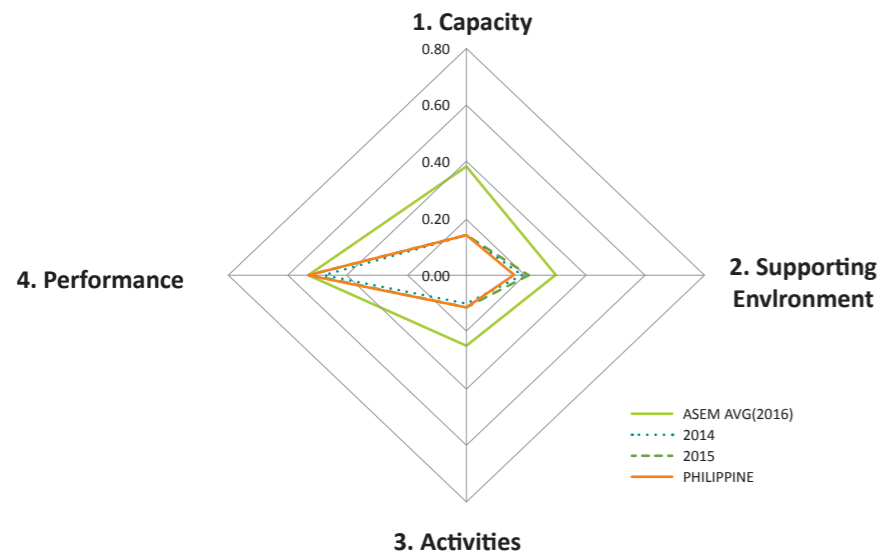


Figure 14. Overview of Analysis on Philippines' Eco-innovation using 2017 ASEI  
Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

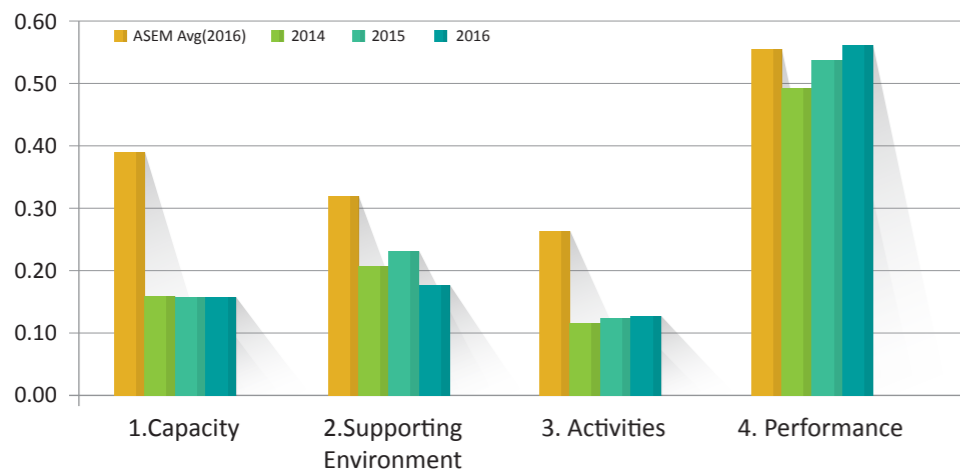


Figure 15. Overview of Analysis on Philippines' Eco-innovation using 2017 ASEI  
Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

■ Eco-innovation Capacity

- Potential to improve national competitiveness in the Philippines showed very high with the score of 0.42 which is very close to 0.56, the average of ASEM countries while general innovation capacity of nation recorded 0.26 which is almost half of the average of ASEM countries (0.54)
- However, in the areas of R&D capacity for environmental science, number of researchers in environmental science and awareness level of company's sustainable management, the Philippines showed very low with the scores of 0.1 and 0.2 compared to the average of ASEM countries in 2016. Therefore, more works need to be done by the government for promoting eco-innovation in the country.

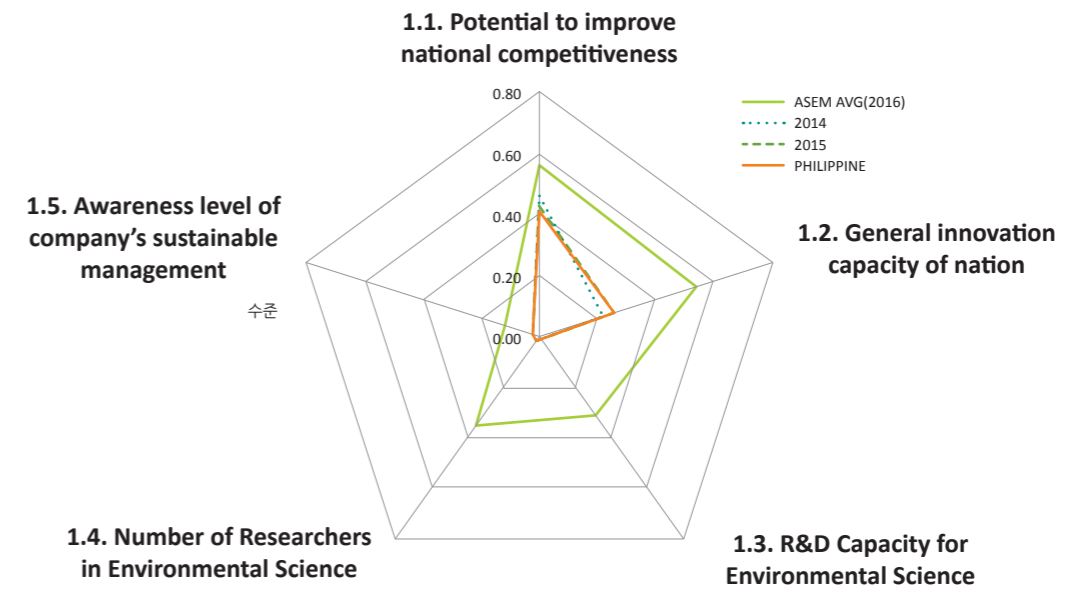


Figure 16. Analysis of Philippines' Eco-Innovation Capacity using 2017 ASEI  
Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

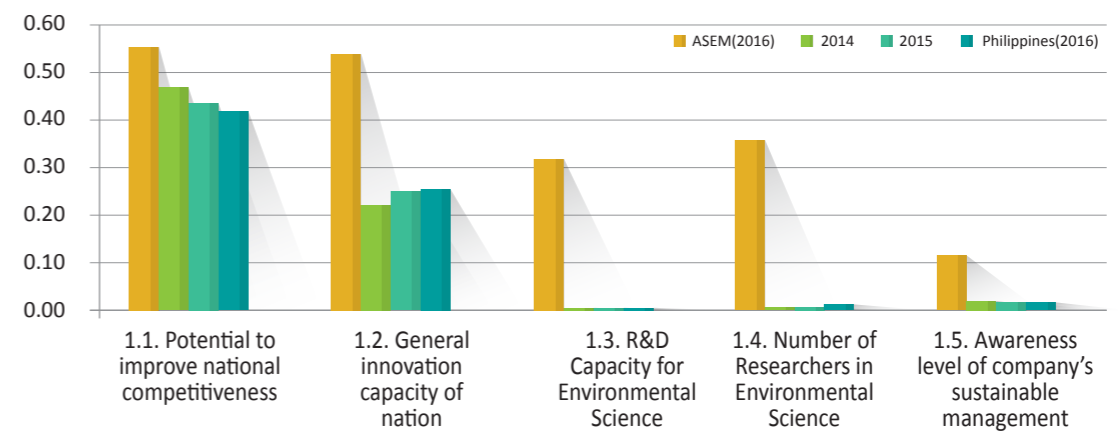
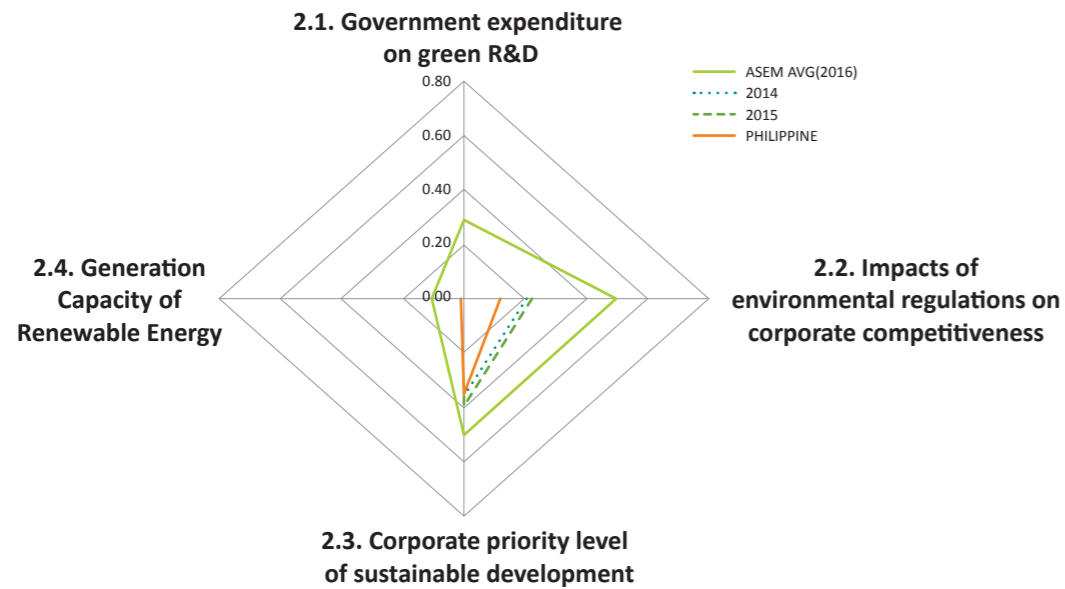


Figure 17. Analysis of Philippines' Eco-Innovation Capacity using 2017 ASEI  
Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

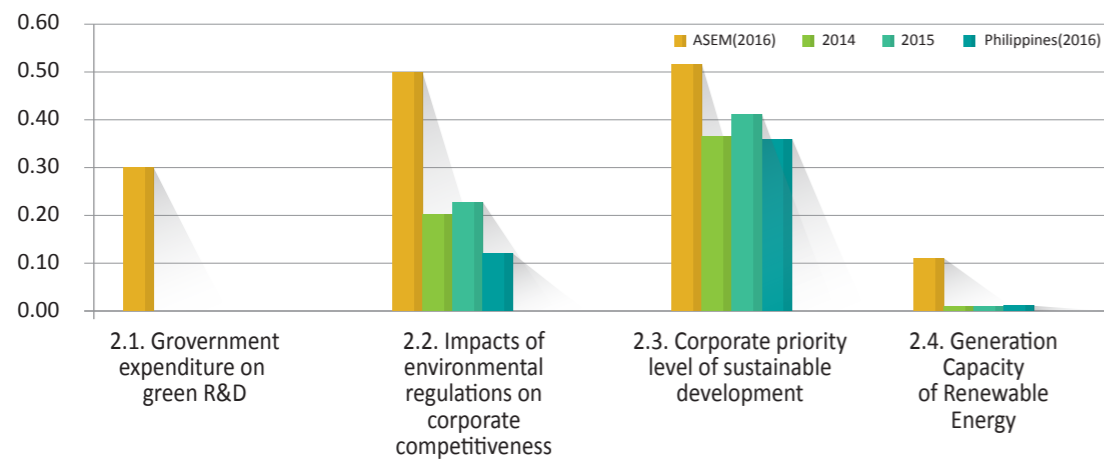


■ **Eco-innovation Supporting Environment**

- Due to lack of data, government expenditure on green R&D was not calculated. All sub indicators appeared low compared to the average of ASEM countries.
- As for corporate priority level of sustainable development, there was no big difference between 2014 and 2016 with the scores of 0.37 and 0.36 respectively. In terms of impacts of environmental regulations on corporate competitiveness, the Philippines showed a slight decrease in 2016 by recording 0.12 compared to 0.20 in 2014.



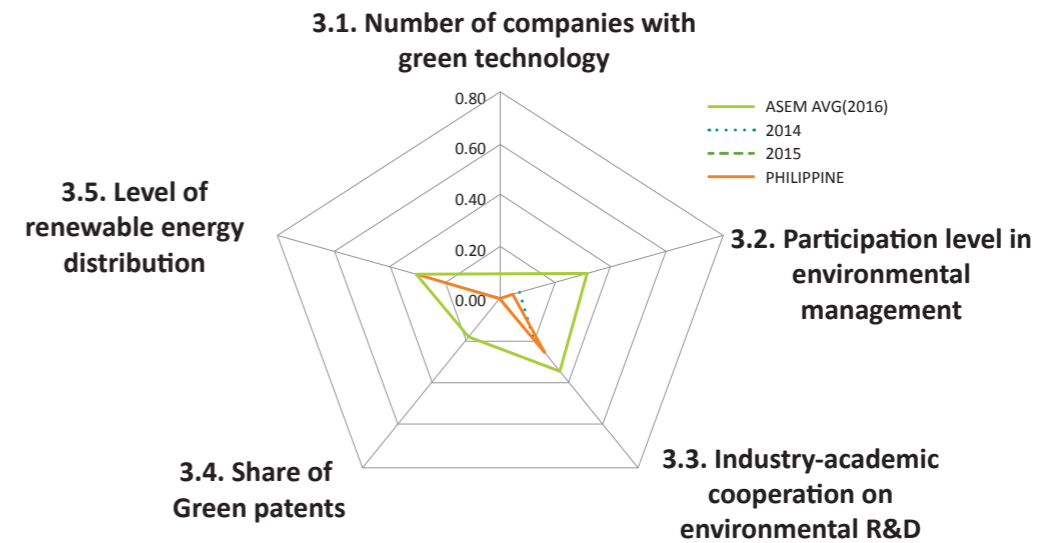
**Figure 18.** Analysis on Philippines' Eco-Innovation Supporting Environment using 2017 ASEI  
 Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index



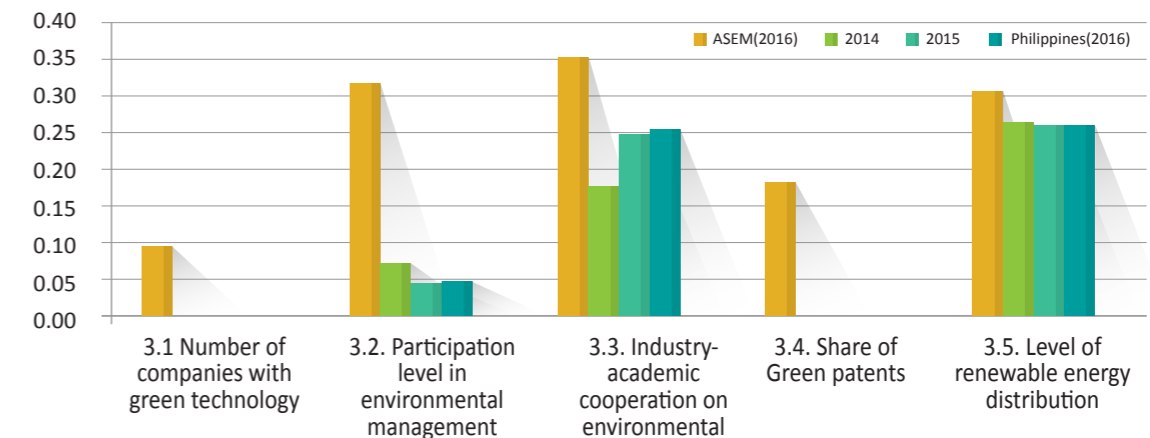
**Figure 19.** Analysis on Philippines' Eco-Innovation Supporting Environment using 2017 ASEI  
 Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

■ **Eco-innovation Activities**

- Filipino industry-academic cooperation on environmental R&D and level of renewable energy distribution showed a relatively small gap compared to the average of ASEM countries in 2016 (0.35 and 0.31 respectively) by scoring 0.26 for both indicators.
- On the contrary, in the areas of share of Green patents and number of companies with green technology, the Philippines turned out to be almost inactive by recording nearly 0.00 for both indicators compared to the average of ASEM countries in 2016 (0.18 and 0.09 respectively)



**Figure 20.** Analysis on Philippines' Eco-Innovation Activities using 2017 ASEI  
 Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index



**Figure 21.** Analysis on Philippines' Eco-Innovation Activities using 2017 ASEI  
 Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

### ■ Eco-innovation Performances

- As for the Quality of life related to environmental impacts which recorded 0.6, there was no big difference compared to the average of ASEM countries (0.71). In particular, the score almost doubled in 2 years when comparing the data for 2014 (0.36) and 2016 (0.60).
- In terms of greenhouse gas emission intensity, the Philippines showed much higher than the average of ASEM countries (0.69) by marking 0.86. In addition, environmental sustainability level also turned out to be very high by recording 1.00 compared to the average of ASEM countries (0.59)
- On the contrary, green industry market size which scored 0.19 appeared quite low compared to the average of ASEM countries (0.50), which means that infrastructure for green industry market is not well developed.

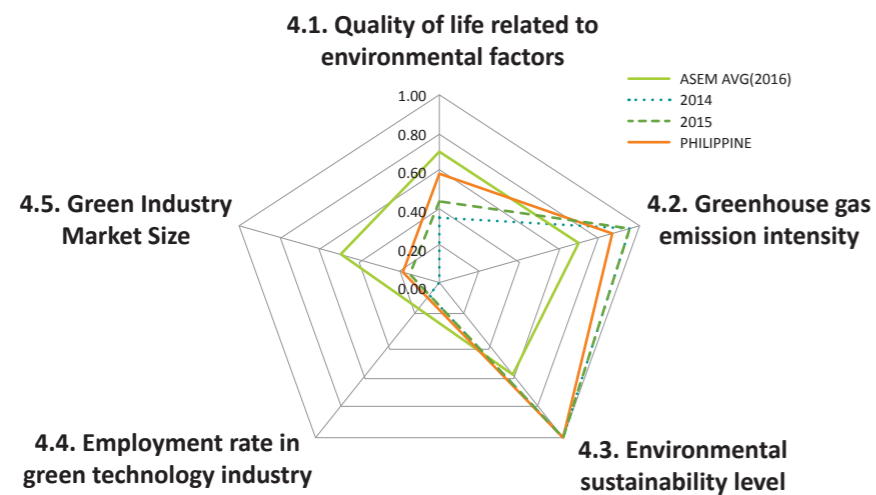


Figure 22. Analysis on Philippines' s Eco-Innovation Performance using 2017 ASEI

Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

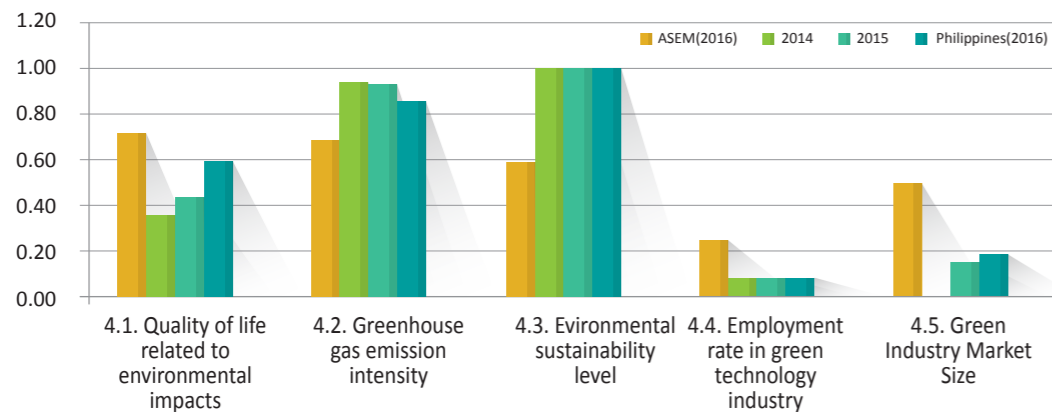


Figure 23. Analysis on Philippines's Eco-Innovation Performance using 2017 ASEI

Source: Author, drawn from results applying 2017 ASEI of which data is specified in table 3. 2017 ASEM Eco-Innovation Index

The Philippines has a distinct multi-faceted feature in terms of the overall eco-innovation ratings. Its geography, policy climate, and human resources shape the Philippine eco-innovation landscape. These pre-conditions will continue to influence the advancement of eco-innovation, aside from the external (and international) dynamics.

The archipelagic character of the Philippines plays a crucial role in the movement of goods and services across all the islands. The logistic challenge of spreading innovations across the major island groups will affect the rate of knowledge and infrastructure spread. This could be addressed by the installation of additional inter-island trade routes. Mobility and telecommunications will be one of the key features that has to be further enhanced to facilitate pursuit of eco-innovation.

Given the good policy landscape of the Philippines, there may be a need to amend a number of nationally enacted policies – to mainstream and further encompass the holistic character of environmental issues. As the policies continue to be integrated into one single direction, the investment climate is expected to become friendlier –thereby attracting local and foreign investments. On the other hand, environmental regulations – especially in the Special Economic Zones (and Export Processing Zones), should be at par with the increasing GDP of the country.

Finally, the human resources of the Philippines are the valuable resources of the country as the ratio of higher education and college education is 84% and 28% respectively. Inherent in the Philippines is its English-speaking population, which further gives them a competitive edge. It gives Filipino entrepreneurs the communication ease with the international business community.

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## Annexes :

## • 2017 ASEM Eco-Innovation Index (ASEI)

Table 5. 2017 ASEM Eco-Innovation Index (ASEI)

Area	Index	Source	Year Collected		Remarks	
Eco-Innovation Capacity	1.1. Potential to improve national competitiveness	WEF	2016	Maintained	Global Competitiveness Index (GCI)	Index
	1.2. General innovation capacity of nation	INSEAD	2016	Maintained	Global Innovation Index (GII)	Index
	1.3. R&D Capacity for Environmental Science	SciVal(Elsevier)	2016	Replaced	Number of published articles	No. of articles/10,000 persons
	1.4. Number of Researchers in Environmental Science	SciVal(Elsevier)	2016	Replaced	No. of published article authors	No. of researchers/10,000 persons
	1.5. Awareness level of company's sustainable management	UN Global Compact	2017	Maintained	No. of companies with sustainable management	Number of companies
Eco-Innovation Supporting Environment	2.1. Government expenditure on green R&D	OECD	2015	Maintained	Gov't environmental R&D expenditure ratio	R&D expenditure ratio (%)
	2.2. Impacts of environmental regulations on corporate competitiveness	IMD	2017	Revised	IMD survey result	10-point scale
	2.3. Corporate priority level of sustainable development	IMD	2017	Replaced	IMD survey result	10-point scale
	2.4. Generation Capacity of Renewable Energy	IRENA	2016	Replaced	Generation capacity	MW/10,000 persons

Area	Index	Source	Year Collected		Remarks	
Eco-Innovation Activities	3.1. Number of companies with green technology	Wisdomain	2016	Revised	No. of companies with green technology (patent application basis)	Number of companies
	3.2. Participation level in environmental management	ISO	2015	Maintained	No. patent certification per GDP(Mil. PPP\$)	No. of environmental certification
	3.3. Industry-academic cooperation on environmental R&D	SciVal(Elsevier)	2016	Replaced	Biz-academic environmental R&D cooperation ratio	Cooperation ratio (%)
	3.4. Share of Green patents	WIPO	2015	Revised	Green patent ratio	Patent ratio (%)
	3.5. Level of renewable energy distribution	IEA	2016	Maintained	Share of renewable energy from total energy generation	Share of renewable energy generation (%)
Eco-Innovation Performance	4.1. Quality of life related to environmental impacts	EPI	2016	Maintained	Environmental Performance Index	Index
	4.2. Greenhouse gas emission intensity	IEA	2014	Maintained	CO <sub>2</sub> concentration	kg CO <sub>2</sub> /2010 USD
	4.3. Environmental sustainability level	WEC	2016	Revised	Environmental sustainability ranking in World Energy Trilemma Index	Index
	4.4. Employment rate in green technology industry	IRENA	2016	Revised	Number of employment	No. of employees/10,000 persons
	4.5. Green Industry Market Size	Wisdomain	2016	Replaced	Ave. number of family countries per patent	Average number of countries

### • Calculation Methodologies for 2017 ASEI

**Table 6.** Calculation Methodologies for 2017 ASEI

Area	Index Name	Calculation Method
Eco-Innovation Capacity	1.1. Potential to improve national competitiveness	WEF GCI of the year
	1.2. General innovation capacity of nation	INSEAD GII of the year
	1.3. R&D Capacity for Environmental Science	No. of environmental sciences articles for the past 5 years (total) per 10,000 persons
	1.4. Number of Researchers in Environmental Science	No. of environmental sciences article authors of the year per 10,000 persons
	1.5. Awareness level of company's sustainable management	No. of companies engaging in sustainable management for the past 5 years (total), 2017 (2013~2017)
Eco-Innovation Supporting Environment	2.1. Government expenditure on green R&D	Gov't environmental R&D expenditure ratio of the year
	2.2. Impacts of environmental regulations on corporate competitiveness	IMD survey index value of the year
	2.3. Corporate priority level of sustainable development	IMD survey index value of the year
	2.4. Generation Capacity of Renewable Energy	Renewable energy generation capacity of the year per 10,000 persons
Eco-Innovation Activities	3.1. Number of companies with green technology	Number of companies with patent applications for the past 5 years, 2016 (2012~2016)
	3.2. Participation level in environmental management	Number of environmental certification of the year per GDP (based on conversion point)
	3.3. Industry- academic cooperation on environmental R&D	Average ratio of cooperation for the past 5 year, 2016 (2012~2016)
	3.4. Share of Green patents	Share of green patent of the year
	3.5. Level of renewable energy distribution	Share of renewable energy of the year from the total of primary energy
Eco-Innovation Performances	4.1. Quality of life related to environmental impacts	Quality of life index of the year
	4.2. Greenhouse gas emission intensity	CO <sub>2</sub> concentration per GDP of the year
	4.3. Environmental sustainability level	Indexed value of environmental sustainability rank of the year
	4.4. Employment rate in green technology industry	Number of employees of the year per 10,000 persons
	4.5. Green Industry Market Size	Average number of family countries for the past 5 years, 2016 (2012~2016)



