

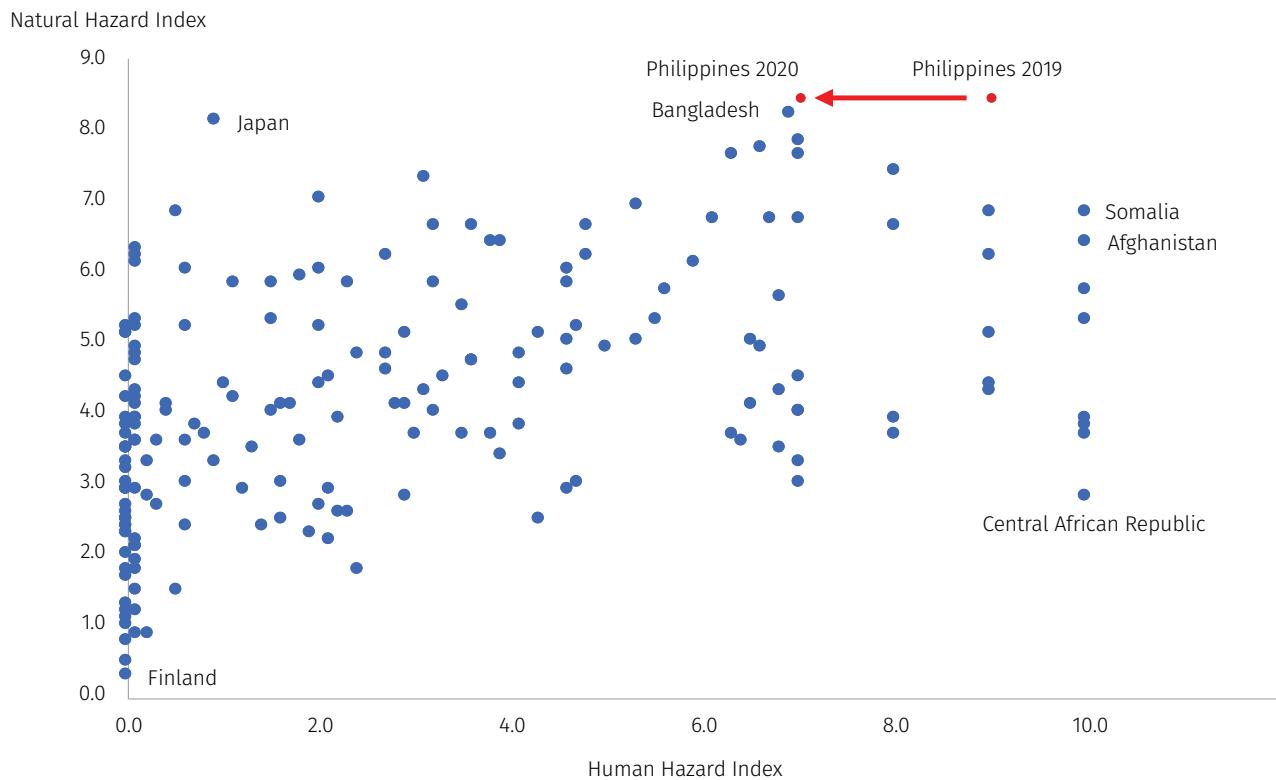


5 RESILIENCE

Geography and history have saddled the Philippines with twin risks of natural disasters and conflict. Many countries have natural disaster hazards or conflict hazards, but very few face high levels of both. The INFORM Global Risk Index identifies the Philippines as having the highest level of natural hazard risk in the world. The country's level of human hazard risk declined in 2019 following the formation of the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) but remains high (Figure 57). These ongoing threats have stifled development and poverty reduction in the areas most directly affected by conflict and disasters. The enduring high level of these risks points to the critical importance of efforts to enhance resilience, principally through effective implementation of a range of climate adaptation measures and follow-through to ensure the success of the 2014 peace agreement with the Moro Islamic Liberation Front (MILF).



Figure 57: Natural Disaster and Conflict Risks



Source: 2020 INFORM Global Risk Index.

5.1. Conflict and Peacebuilding

The Philippines has a complex multi-layered history of conflict that has involved armed groups including Muslim separatists, communists, clan militias and criminal groups. Although a long-running conflict with the communist New People's Army (NPA) simmers at a low level in rural areas across the country, the principal peacebuilding challenges involve a limited geographic area in western Mindanao. Conflict has been an acute obstacle to development and poverty reduction in directly affected areas. It has also had some impact on the broader Mindanao region and the Philippines overall. While they disrupt development, none of the conflicts pose a risk to the Philippine state. The various conflict actors are outlined in Box 7.

The roots of the Mindanao conflict stretch back several centuries, with a modern phase growing from developments in the 1960s. The area was historically largely Muslim due to influence from the Malay Archipelago predating Spanish colonization. During the 1960s, the national government pursued a policy of fostering development in Mindanao and integrating its indigenous inhabitants to mainstream Philippine society. A core element of that policy was resettlement of people from elsewhere in the country. The resettlement policies eventually resulted in a Christian majority in Mindanao overall, with Muslim-majority areas limited to the western portion of Mindanao. Social exclusion of Muslim residents fomented conflict, which led to the founding of the Moro National Liberation Front (MNLF) in 1971 with the goal of fighting for an independent Muslim state in Mindanao.

Box 7: Conflict Actors in the Philippines

Muslim armed groups: The two main groups are the Moro National Liberation Front (MNLF), founded in 1971, and the Moro Islamic Liberation Front (MILF), established in 1984 as a breakaway group from the MNLF. A peace agreement between the MNLF and the government led to the establishment of the Autonomous Region in Muslim Mindanao (ARMM) in 1990. A final peace agreement between the government and the MILF signed in 2014 led to the creation of the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) in 2019.

Radical Islamic groups: Abu Sayyaf has links to the Islamic State of Iraq and the Levant (ISIL). It has carried out kidnappings for ransom and bombings, which have been condemned by both the MNLF and MILF. Abu Sayyaf and another group (the Maute) were responsible for the conflict in the city of Marawi in 2017.

Communist insurgency: The New People's Army (NPA) was founded in 1969 as the military wing of the Communist Party of the Philippines (CPP). Despite

peace efforts in recent years, the CPP-NPA has continued to commit acts of violence in various parts of the country. The CPP-NPA was designated as a terrorist organization by the government in 2017.

Banditry by armed criminal groups: Occurrence of banditry in certain areas of Mindanao is evident. These groups engage in sea piracy, extortion, smuggling, human smuggling and trafficking, kidnapping for ransom, drug and arms trade, and other criminal activities.

Clans: Interclan feuds, called "rido," are pervasive and have a long history in western Mindanao. Rido is triggered by offenses that tarnish "maratabat," or deep sense of clan honor, and can morph into vertical conflict when feuding clans have links to larger armed groups.

Political actors: Assassination and armed conflict between rival political groups have long been a feature of Philippines politics, particularly at the local level.

The complex roots of violence in Mindanao resist simple explanation. While the core conflict has been between Muslim armed groups and the government, it is not primarily religious. A list of the endemic drivers of violence in the region would include (1) social injustice and alienation, and exclusion of Muslim and indigenous peoples, (2) suppression of Muslim and indigenous traditions, customs, and institutions, (3) interethnic conflicts, (d) rido, or clan wars, and revenge killings, (4) land tenure and ownership disputes, (5) competition for scarce natural and mineral resources, (6) local election disputes, (7) ineffective governance and lack of rule of law and service delivery, and (8) widespread poverty and lack of job opportunities.

The principal impact of conflict has been in the areas which now make up BARMM. Those areas lag the rest of the country in delivery of basic social services as electricity, education, health, water, and sanitation. One estimate puts the direct costs of conflict in Mindanao at two to three billion dollars for 1970-2001 (Schiavo-Campo and Judd 2005). Conflict's nonmonetary ill effects also take the form of the loss of cultural identity and social cohesion, loss of personal dignity, prejudice, ethnic and social tensions, and a rise in kidnapping, drug trafficking, and other illegal activities.

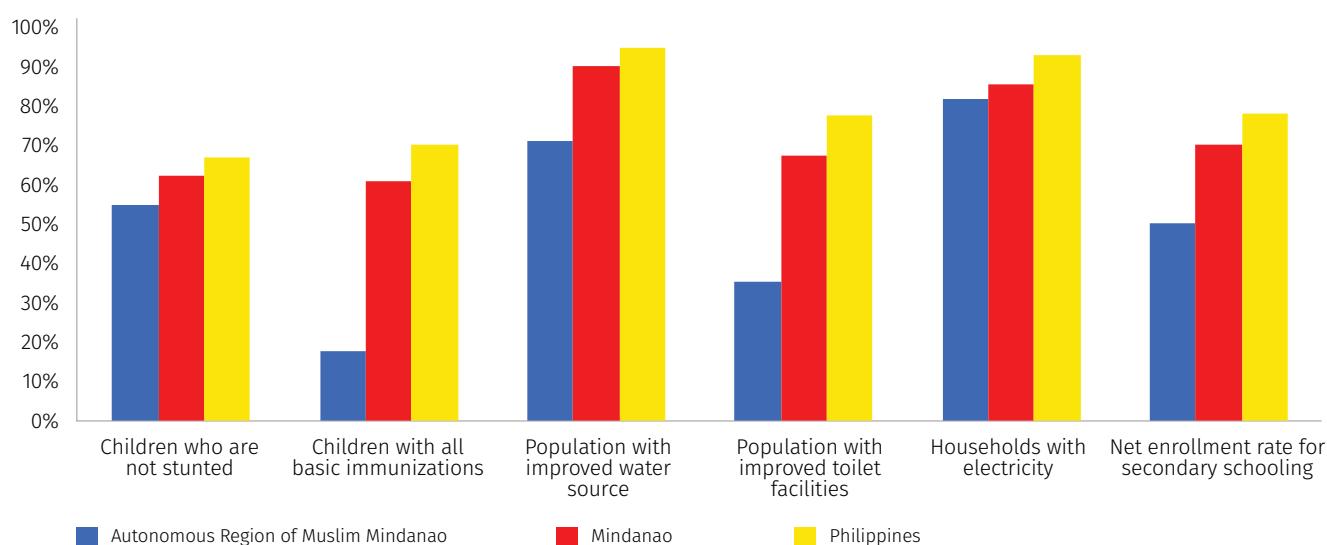
Conflict-related displacement has had high costs. A World Bank and World Food Programme (WFP) survey

in 2011 showed that four in every 10 households in central Mindanao had been displaced at least once between 2000 and 2010 and one in 10 forced to leave their homes five times. Displacement disrupts all aspects of the economy, to the detriment of livelihoods, welfare, social cohesion, and service access. The impact of displacement does not end when people return home: returnee households were almost as vulnerable as those who were still displaced at the time of the survey.

Conflict-affected areas of Mindanao have followed a pattern different from Mindanao as a whole.

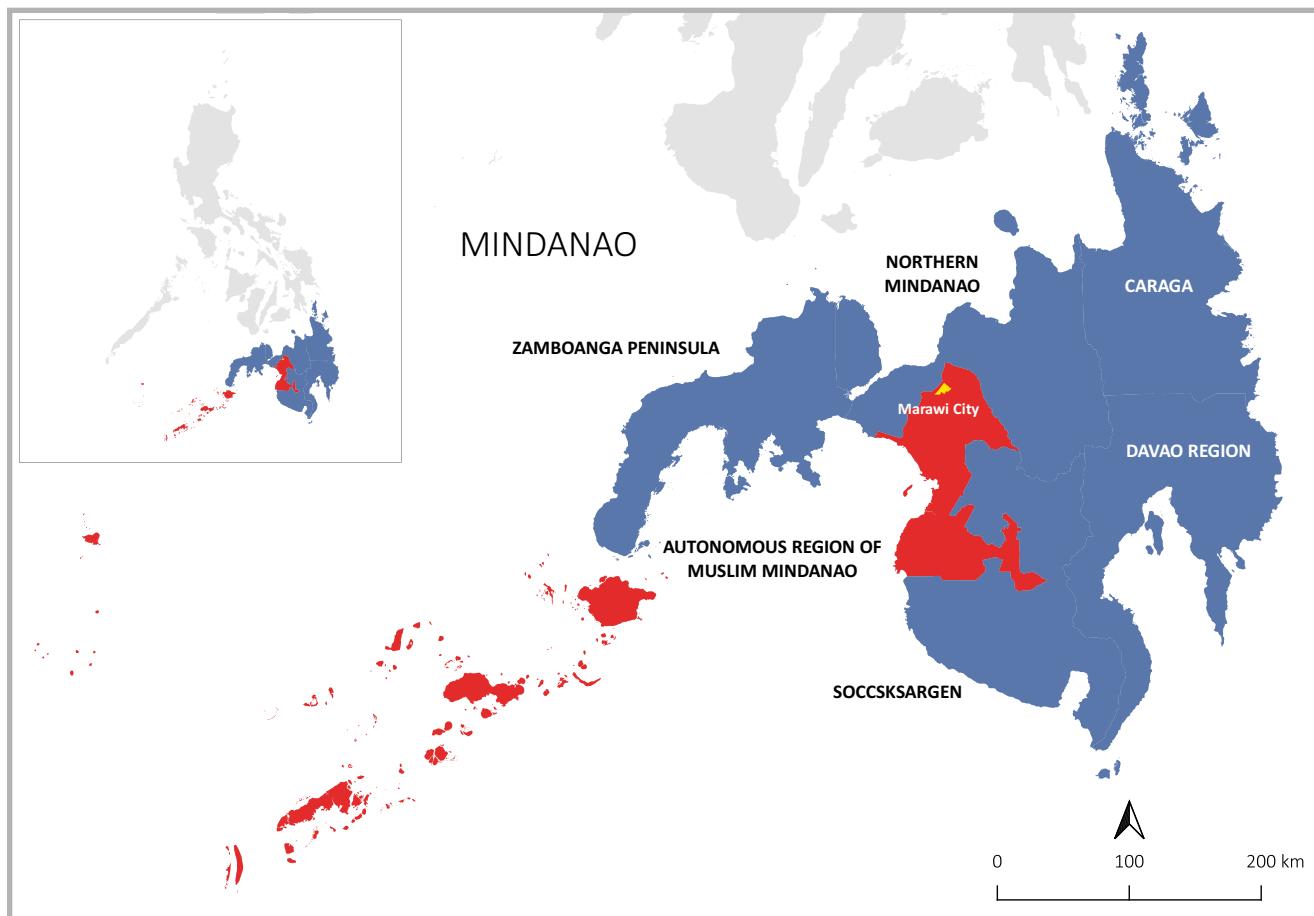
Historically and up through the 1990s, economic growth in Mindanao overall lagged far behind the country as a whole. Consequently, the level of economic output in the region is far below that of Luzon and Visayas, and poverty rates are much higher. Since the turn of the millennium, however, growth rates in the region have matched the high rates in the rest of the country, and poverty has started to come down. Growth has been buoyed by the performance of Davao City and its surrounding region. The glaring exception within Mindanao has been the conflict-affected areas, which have seen little improvement since 2000. Across all indicators of service access and well-being, ARMM stands out as worse than Mindanao and much worse than the Philippines overall (Figure 58).

Figure 58: Socioeconomic Indicators in the Philippines, Mindanao, and ARMM



Source: 2015 National Nutrition Survey for stunting and 2017 Demographic and Health Survey for other measures.

Map 5: Mindanao, the Autonomous Region of Muslim Mindanao, and Marawi City



Note: The former Autonomous Region in Muslim Mindanao (ARMM) is shown in red and Marawi City in yellow. The new Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) includes the ARMM and other areas, including Cotabato City.

The conflicts have had some impacts beyond the most affected areas in western Mindanao. Other areas in Mindanao and elsewhere have had to absorb refugees and have experienced spillover incidents of violence, including a bombing at a market in Davao City in 2016. Foreign government advisories discourage travel to all of Mindanao, which is likely to have reduced international tourism and investment in the region. While it is difficult to draw definitive links, the conflict may also have reduced tourism and investment for the Philippines as a whole. Activities of the NPA in various parts of the country, although limited in scale, have also disrupted economic activity and government service delivery.

The latest Global Terrorism Index ranked the Philippines among the top 10 countries affected by fatal terrorist attacks. Villages in some areas of Mindanao are reportedly under threat from ISIS-inspired local groups. The occurrence of ISIS-linked or -inspired violence in Jakarta, Mindanao, and Puchong, near Kuala Lumpur, has raised fears of a new era of transnational jihadist terrorism in Southeast Asia.

Protracted, low-intensity conflicts generate a fertile ground for the violent radicalization of tired and disenchanted fighters. The Marawi crisis typifies the risks present in conflict-affected Mindanao. The five-month-long siege in that city started on May 2017,

between Philippine's government security forces and militants affiliated with the ISIL, including the Maute and Abu Sayyaf Salafi jihadist groups. The siege resulted in the destruction of 95 percent of the infrastructure in the main battle area and displaced over 350,000 inhabitants.

Persistent security risks illustrate how quickly a protracted sub-national conflict in otherwise a stable middle-income country can be captured by violent extremists, putting additional burden on the region already constrained by weak institutions, fragile conditions, and widespread poverty. The growing influence of violent extremist groups further highlights the need to deliver on the "peace dividend" for conflict-affected communities in Mindanao to stem the escalation of violence. Prevention of violent extremism has become an important global agenda that requires cross-regional and global collaborations.

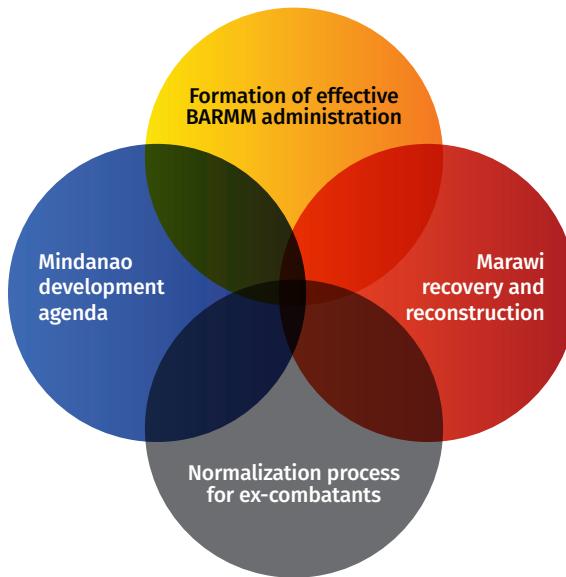
The Peacebuilding Agenda for the Bangsamoro Autonomous Region

The year 2019 is an important milestone in the peacebuilding process. In 2014, the government and the MILF signed the Comprehensive Agreement on the Bangsamoro (CAB), ending decades of conflict. The MILF promised to decommission its troops and end the decades-long rebellion once the national government delivers its commitment of a new Bangsamoro region. The government approved the law creating the new region in 2018, and a related plebiscite was held in early 2019.

Implementation of the peace agreement will be fraught with challenges and uncertainty. The peace process has created the BARMM, superseding the ARMM region created by an earlier peace agreement and covering a larger geography. Among the challenges are creating a new and effective bureaucracy, the recovery and reconstruction of Marawi, the normalization process for former combatants, and advancing the broad development agenda for the region (Figure 59).

Ensuring that the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) develops an effective

Figure 59: Interlinked Peacebuilding Challenges



structure is critical to avoid a return to conflict.

BARMM will need resources along with the trust and support of the national government if it is to succeed.

Successful normalization of ex-combatants is another critical ingredient for peacebuilding. A recent profile found that while they are poor in material terms and have limited access to government services, they have on average fairly high levels of education. Overall, ex-combatants are optimistic about the future and aspire to help build peace and stability in their communities (Institute of Bangsamoro Studies 2018).

The recovery and reconstruction of Marawi also constitute a vital step to build the peace. Two years after the start of the Marawi siege, little progress has been made on reconstruction, and the most affected area of the city remains uninhabitable. There is a substantial danger that if Marawi is not adequately rebuilt, the enduring spectacle of its desolation could make it a breeding ground for resentment and thus recruitment of militants.

The cessation of armed conflict has brought enormous expectations as well as widespread hope to the region. If the implementation of the Comprehensive Agreement on the Bangsamoro (CAB) between the government and the MILF is successful, the resulting peace dividend has the potential to free up significant public and



private resources for more productive use, secure large territorial areas for settlement and investment, reduce uncertainties in future planning, ease crippling social hardship, and enable more geographically equitable provision of public and infrastructure services.

5.2. Climate Change, Environmental, and Disaster Risks

The Philippines' very high exposure to natural hazards poses a principal threat to economic growth and inclusion. Natural disasters generate large costs for the economy, which are borne disproportionately by the poor and vulnerable. In the absence of mitigation and adaptation measures, climate change may have massive impacts on economic growth and welfare by accelerating myriad disaster and environmental risks. The Philippine Development Plan (PDP) identifies

climate change as one of the main challenges in achieving inclusive rapid and sustainable growth.

At least 74 percent of Filipinos are vulnerable to natural disasters, which have killed 33,000 people and adversely affected 120 million in the last 30 years (GFDRR and World Bank 2011). The Philippines has experienced more than 90 destructive earthquakes and 40 tsunamis in its history (Philippine Institute of Volcanology and Seismology 2013). The most frequent of the 2,754 natural hazard events that took place during 2005–15 were climate-related. Around 90 percent of damage in recent years has been from typhoons. In September 2009, typhoon Ketsana (Ondoy) struck Metro Manila, flooding parts of the city and leading to significant economic losses. Since then, the Government has been taking measures to reduce flood risks in the city and is now considering building a dam on the Marikina river to reduce flood risks. The country and particularly Metro Manila are at high risk of a major earthquake.

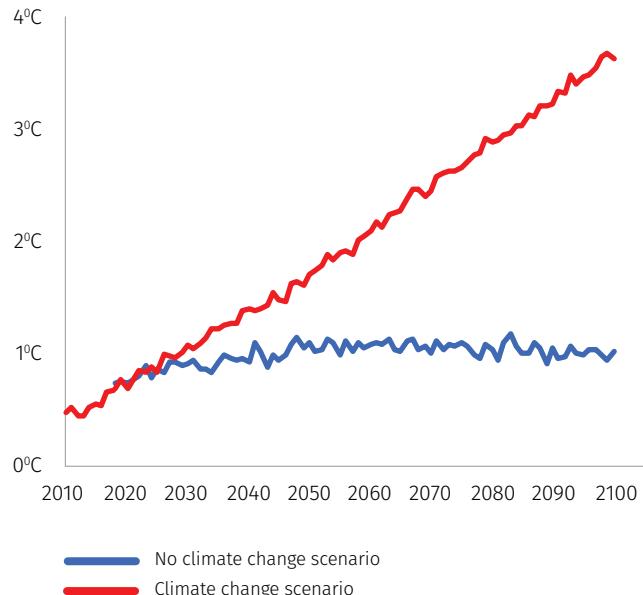
Disasters have major economic impacts. Expected annual asset losses for the Philippines are ₱233 billion on average, 75 percent of which are due to typhoons and the remaining to earthquakes (AIR Worldwide 2018). In 2013, Super Typhoon Yolanda alone killed 6,300, wounded 28,689 persons, and caused ₱571.1 billion in damage, according to data from the Philippines Statistical Authority. A projected 7.2-magnitude earthquake on the West Valley Fault, which crosses Metro Manila, could have catastrophic impacts, including 48,000 fatalities and \$48 billion in economic losses (Philippine Institute of Volcanology and Seismology 2013).

The agriculture sector is highly affected by extreme climate events. Non-typhoon-related floods are common during the southwest (summer) monsoon. When the monsoon coincides with a shift of the intertropical convergence zone over the Philippines, such as in 2014, flood-related economic damage spikes. Conversely, droughts and dry spells linked to El Niño cause significant economic damage to agriculture, including 42–50 percent of total weather- and climate-related damages in 2010, 2013, 2014, and 2016.

Several parts of the country already have chronic water supply deficits. Current unmet water demand is estimated at 32 percent nationally, mainly due to the 33 percent water supply gap for agricultural purposes.

The impacts of disasters on the poor are severe. Poor people are more likely to depend on disaster-vulnerable livelihoods and live in unsafe areas. They invest less in reducing their risk, lose more when they are hit by a disaster, and receive less support to cope and recover. Farmers and fishers are particularly exposed to climate impacts. In barangays that have experienced a typhoon within the previous six months, household consumption falls by 6.7 percent and protein consumption by 10 percent, aggravating malnutrition in these areas. The poorest fifth of households suffers 9 percent of the total asset losses from disasters, but 31 percent of the total welfare losses. In the most exposed areas at the eastern edge of the country, over a third of the nonpoor population is at risk of being pushed into poverty by typhoons (Skoufias et al. 2019; Walsh and Hallegatte 2019).

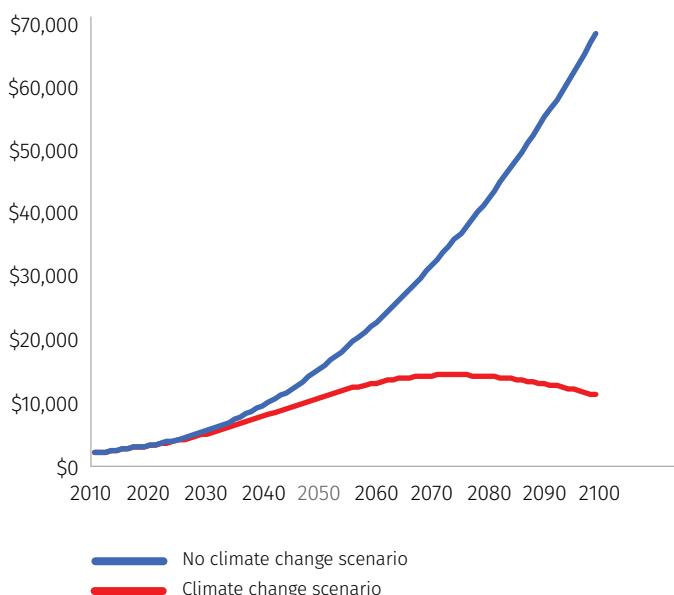
Figure 60: Recent and Projected Increases in Temperatures for the Philippines



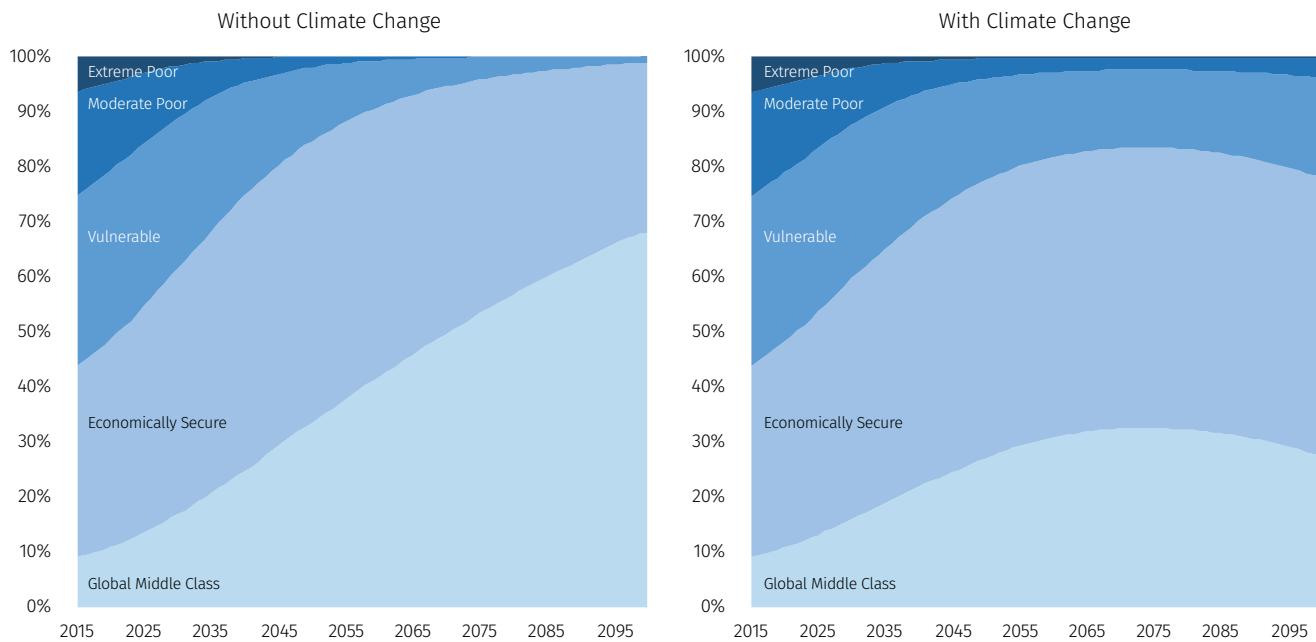
Source: World Bank staff analysis of data from Carbon Brief (2018). Note: The climate change scenario corresponds to representative concentration pathway (RCP) 8.5. The no climate change scenario here corresponds to RCP 2.6. Temperature changes are relative to the 1951–1980 average.

Climate change may have already reduced economic growth and could have very large economic impacts in the future. Temperatures in the Philippines have risen by 0.68°C since 1950 and are projected to rise by more than 3°C under a high emissions scenario (Figure 60). Climate change thus far may have reduced economic output in the Philippines by a cumulative 25 percent (Diffenbaugh and Burke 2019). Projections suggest that without mitigation and adaptation, future climate change could have a huge impact on the country's economy, stifling all growth by 2075 (Figure 61). Under a "no climate change scenario" the fraction of the population who are poor or vulnerable by current standards will fall to zero, and most Filipinos will join the global middle class by 2075. In contrast, under a climate change scenario, without mitigation or adaptation, most Filipinos will never reach the global middle class (Figure 62). This threat highlights the critical need for the Philippines to take climate mitigation and adaptation measures to avoid this scenario.

Figure 61: Recent and Projected GDP per Capita for the Philippines



Source: World Bank staff analysis. The 2010–18 GDP per capita numbers are from World Development Indicators. Subsequent figures are projected based on growth rates from Burke, Hsiang, and Miguel (2015). Note: Figures are in 2010 US\$. The climate change scenario corresponds to representative concentration pathway (RCP) 8.5. The no climate change scenario corresponds to temperatures remaining fixed at their 1980–2010 average.

Figure 62: Projected Economic Class Distribution for the Philippines

Source: World Bank staff calculations.

Notes: Figures show the fraction of the population projected to be in each economic class under scenarios with and without climate change. The projections are based on a microsimulation of household income growth, assuming GDP per capita growth rates as shown in Figure 5.5, the same “pass-through” rate of GDP per capita growth to average household income growth observed for 2006–15, and an equal rate of income growth across all households. Economic classes are defined in terms of household income per person as follows: Extreme Poor (less than PPP \$1.90 a day), Moderate Poor (PPP \$1.90–\$3.10 a day), Vulnerable (PPP \$3.10–\$5.50 – a day), Economically Secure (PPP \$5.50–\$15.00 a day), Global Middle Class: PPP \$15.00 and higher a day.

The projected economic impacts reflect a cascade of climate change effects. Projections indicate climate change will generate a drier dry season, wetter wet season, and wetter northeast monsoon season. The frequency and severity of typhoons will increase (Crepin 2013). Sea levels will rise, and an increase of 1 meter in sea level may submerge many small islands. Sixty percent of Philippine cities and municipalities are located along coastal areas; many will be at high risk of coastal flooding and coastal erosion.

Climate change will have a variety of impacts.

- **Agriculture.** Rice yields may fall by up to 75 percent in the Philippines by 2100 compared with 1990 (Asian Development Bank 2009). Pest infestations are also expected to increase.
- **Fisheries and aquaculture.** The seas around the Philippines are expected to be severely affected by changes in temperature, precipitation, ocean acidification, oxygen depletion, and sea level rise.

Warmer waters associated with the El Niño event in 2016 led to documented declines in seaweed and farmed fish production of up to 16 percent in Palawan due to disease, mortality, and reduced growth rates. A simulation analysis of the effects of climate change on small fish suggests massive declines in catch value, leading to a total economic loss estimated at \$165–700 million per year (Briones et al. 2005).

- **Ecosystems.** Around 1 million hectares of forest are vulnerable, with natural forests in the provinces of Davao del Sur, Leyte, Sarangani, Sultan Kudarat, and Zamboanga del Norte projected to experience reduced rainfall and increasing frequency of drought conditions (Philippines Climate Change Assessment 2017). Climate impacts on coral reefs have been documented. The longer-term risk to the estimated \$4 billion per year provided by coral reef ecosystem services through coastal protection, fisheries, and tourism is high (Tamayo et al. 2018).

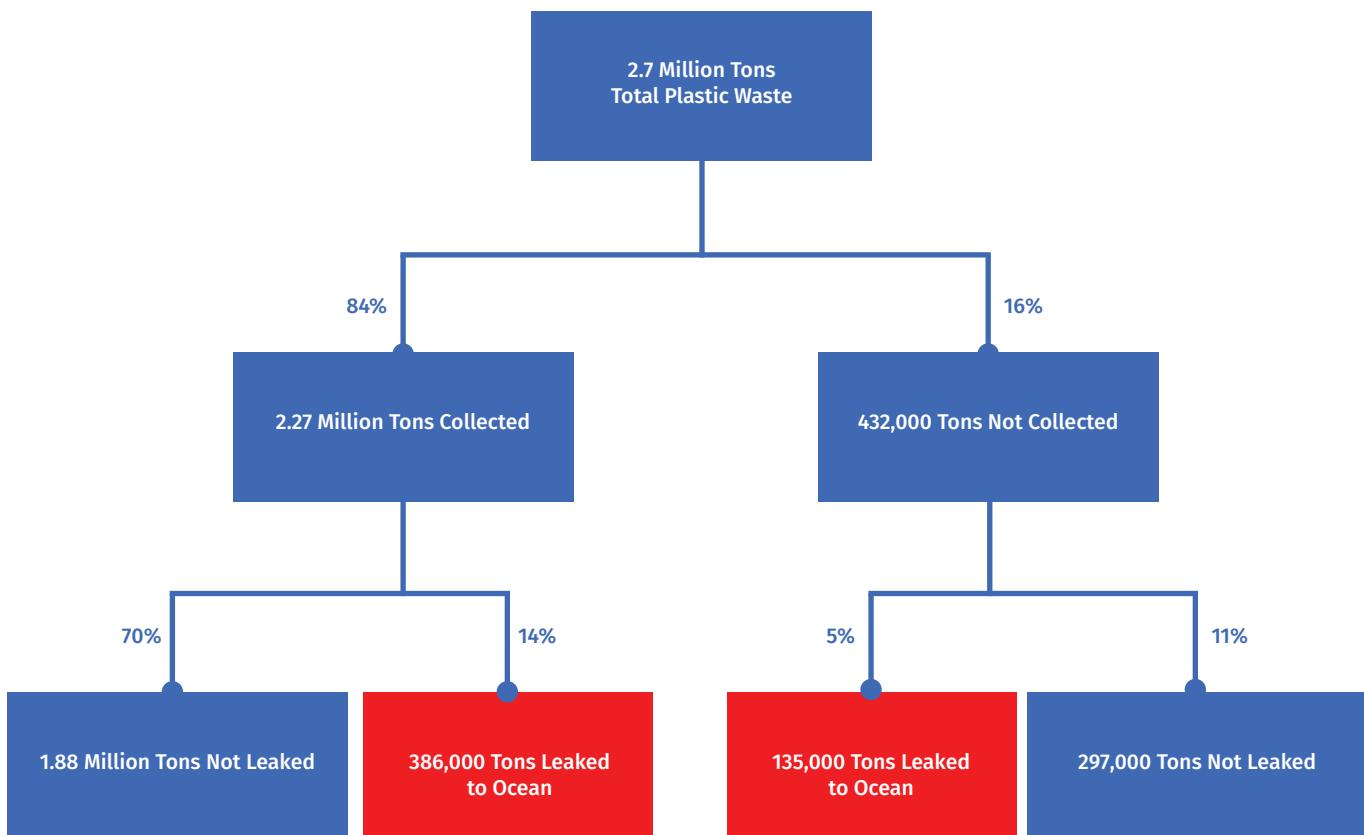
- **Health.** Climate change is expected to increase malaria, cholera, diarrhea, dengue, and cardiovascular and respiratory issues. The Philippines will be one of the countries most affected by increasing deaths from heat waves due to climate change, with mortality rates more than doubling in the “best case” scenarios (Guo et al. 2018).
- **Conflict.** Although the precise mechanisms are not well understood, global evidence suggests that climate change is likely to increase violent conflict. Overall, for a one standard deviation increase in temperatures or extreme rainfall, the frequency of interpersonal violence rises by 4 percent and the frequency of intergroup conflict by 14 percent (Hsiang, Burke, and Miguel 2013). In the Philippines, negative rainfall shocks have been shown to increase conflict incidents initiated by insurgents (Crost et al. 2018).

The Philippines also suffers from a range of risks due to environmental degradation and pollution. Air pollution is estimated to cause more than 150 deaths per day in the Philippines, and the total welfare loss from air pollution is estimated to be 4.3 percent of GDP (World Bank and IHME 2016). The urban poor are typically at greatest risk from exposure to both air pollution and solid waste, as well as the impacts of flooding arising from drainage channels clogged with waste.

Solid waste management is a growing problem, with global implications due to marine plastic pollution.

Solid waste in the Philippines, which is mostly disposed of in environmentally noncompliant landfills, is expected to increase from 14.6 metric tons per year in 2016 to 29 metric tons per year in 2050 and (Kaza et al. 2018). Only 31 percent of barangays have access to a materials recovery facility, a key component of an effective solid waste management system. The Philippines is among the top five emitters of plastic wastes in the ocean (Figure 63).

Figure 63: Flows of Plastic Waste in the Philippines



Manila Bay is central to the economic development of the country but is suffering from acute water quality issues. Manila Bay directly supports the lives of some 30 million people and functions as the country's main port. Its beaches, once a recreational resource for greater Manila's 13 million residents, are littered with garbage, much of it plastic (Parker 2018). A Supreme Court ruling in December 2008 required all relevant government agencies to undertake the cleanup, rehabilitation, protection, and preservation of Manila Bay as part of their statutory responsibilities, but there has been little improvement in the ensuing decade. A Manila Bay Sustainable Development Master Plan is being formulated.

Environmental, climate, and disaster vulnerabilities exacerbate one another. Droughts and more erratic rains intensify the impact of poor land and water management on soil health. Water scarcity is aggravated by the deterioration of water quality due to pollution from untreated domestic sewage, industrial wastewater, agricultural runoff, and urban runoff. Widespread mining and deforestation in Mindanao were blamed for the 2011 and 2012 flash floods when typhoons Sendong and Pablo hit the country and took the lives of about 1,000 people. Neglect of drainage systems and lack of long-term planning and enforcement exacerbated the flood in 2012 that swamped nearly all of Manila. Projected increases in extreme rainfall events, alongside the historical loss of forest cover from 90 percent of total land area to 23 percent in 2010, compound the risk of landslides (GFDRR and World Bank 2011). The impact of the massive 2006 landslide in Leyte was exacerbated by extensive logging along mountain slopes. Rising temperatures will also intensify the health impacts of air pollution.

This negative confluence of environmental and climate-related risks is acute in coastal areas. More than half (55 percent) of municipalities and major cities are close to coasts, and approximately 16.7 percent of the total population live in low-elevation coastal zones.²³ Climate change is expected to lead to

more intense typhoons, coastal flooding, and stress on marine ecosystems. Climate scenarios project potential losses of 52.3 percent of coastal GDP with intensification of storm surges by 2100. Meanwhile, pollution and overexploitation of coastal ecosystems affect their economic functions and resilience to climate change. Mangroves reduce coastal flooding by about 20 percent, averting around \$1 billion of damages to 613,000 people annually. If restored to 1950s level, mangroves would avert another \$0.5 billion, but they are still being lost—by around 2 percent from 2000–15. The recent closure of Boracay to tourism due to severe water quality issues—mainly inadequate wastewater treatment—came at great economic cost.

The Philippines has demonstrated a strong commitment to addressing climate and disaster risks, but implementation challenges remain. The Climate Change Act of 2009 paved the way for the adoption of a long-term roadmap for climate action, focusing on building an enabling environment and scaling up climate investments. The Philippine Disaster Risk Reduction and Management Act of 2010 emphasized a substantial policy shift from emergency response to disaster preparedness, resilience, and financial protection. The Philippines has had a strong performance in some areas of disaster risk management. Government response in the wake of natural disasters such as typhoons has generally been well managed. And the government has managed the fiscal risks well with a disaster risk insurance program.

The high level of current disaster risk in tandem with the looming threat of climate change points to the need to ramp up disaster resilience and climate adaptation efforts. The Philippines has put in place the key building blocks for such an approach. Government policy recognizes the need for a long-term roadmap for climate action as well as efforts for disaster preparedness and resilience rather than disaster emergency response alone. The government is considering establishing an agency to lead disaster response as well as integrate climate and disaster resilience programs at the national and local levels.

²³ In 2000, low-elevation coastal zones (LECZs) represent less than 6.8 percent of the total land area of the Philippines. The share of the national population located in LECZs (16.7 percent) is much larger than the relative area of the zone. The coastal population is projected to approximately double by 2060 (ADB 2017).

Current efforts are insufficient to address growing climate and disaster risks. Climate change expenditure tagging (CCET) has been carried out on the national budget since 2015 and has shown an increase in the allocation to projects and programs linked to climate action from 4.5 percent in 2015 to a proposed 6.5 percent of the national budget in 2019. Local government units (LGUs) have a high level of demand for additional investments in climate resilience, and struggle to effectively access those funds that are intended to support them such as Disaster Risk Reduction and Management funds and the Peoples' Survival Fund. Many national agencies and LGUs have not substantially integrated risk-informed and prioritized investments into their programs, and there have not been effective mechanisms for coordination or evaluating progress.

The government's Risk Resiliency Program (RRP), established through the Program Convergence Budgeting (PCB) approach in 2015, requires strengthening. Incentives for national agencies to participate in the RRP lack clarity. The criteria and procedures for RRP investments are inadequate. Resilience investment needs at the local level should be systematically identified and prioritized for integration into the national budget and mobilization of external funding.

Many different types of investments can make the Philippines more resilient to climate change. Four key categories of intervention where more investment is required are as follows:

1. **Coastal protection.** Restoration and protection of mangrove forests and coral reefs, combined with sea walls and engineered coastal defenses, reduce vulnerability to storm surges. Good examples of what can be done include the restoration of mangroves on Siargao Island in Surigao del Norte and Calbiga, Samar under the DENR's Enhanced National Greening Program (ENGP). Mangrove restoration has also benefitted local communities on Siargao by increasing shellfish availability.

2. **Climate-resilient agriculture.** Examples of climate-resilient technologies include the adoption of stress-tolerant varieties of crops and the use of alternate wet and dry techniques for rice cultivation to reduce water consumption. Many of the actions in the agricultural sectors are 'win-win' for both adaptation and mitigation. For example, alternative watering and drying (AWD) for rice is a key adaptation measure as it reduces overall water consumption, but it also leads to reduced methane emissions.
3. **Management of water resources.** Such efforts encompass introduction of water-efficient irrigation, increasing water storage capacity, and restoring forest cover and natural function of watersheds.
4. **Infrastructure.** Transport, water, and other resources in both rural and urban areas can be made climate resilient. Farm-to-market roads can be made more resilient through raising road levels and concretizing and expanding road drainage systems. Technical standards for lifeline infrastructure like water supply, drainage, wastewater, transport and electricity can be revised to reflect that extreme weather scenarios now occur more frequently.

Boosting education levels can also help enhance climate and disaster resilience. Globally, higher levels of education (especially for girls) are strongly associated with lower levels of fatalities from disasters. Filipinos with higher levels of education are more likely to prepare for disasters (Hoffmann and Muttarak 2017; Lutz, Muttarak, and Striessnig 2014). Additionally, education can help drive public concern about climate change. When asked "How serious of a threat is global warming to you and your family?" 37 percent of Filipinos with primary education or less and 60 percent of those with tertiary education said it was a "very serious" threat (World Bank staff analysis of Gallup World Poll data from 2010.)

Further efforts are needed to improve earthquake preparation for Metro Manila. The top need is strengthening and retrofitting public buildings and structures such as schools, hospitals, bridges, and flood control structures. Other areas for attention are updating building standards, enhancing emergency management systems, and developing government service and business continuity systems. Development of additional water sources is needed to make the city earthquake resilient. The city currently depends on one source for 97 percent of its water.

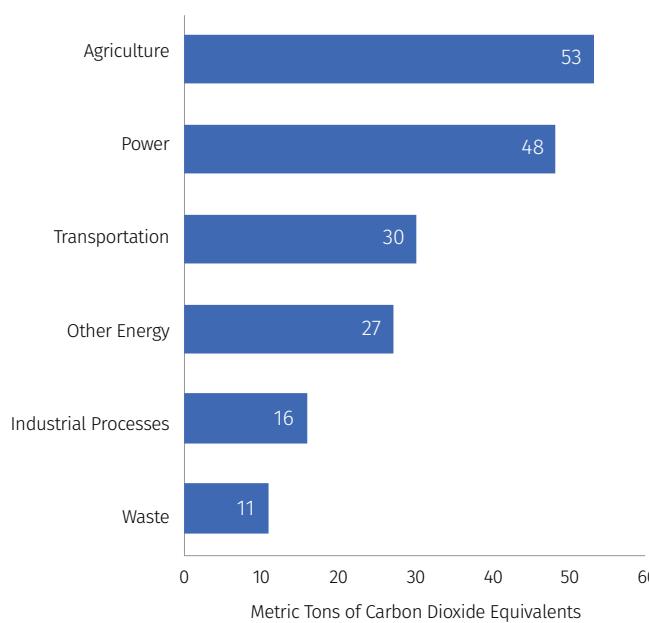
As one of the most climate-affected countries in the world, the Philippines also has a strong interest in joining worldwide efforts to cut greenhouse gas (GHG) emissions. The demonstration effect of the Philippines can help spur other countries to action on climate mitigation, and many countries are working to chart a “low carbon” future. Costa Rica, for example, has launched an economy-wide plan to achieve zero net emissions by 2050. Cutting GHG would also have large public health benefits by reducing air pollution, which reduces worker productivity and is responsible for nearly 64,000 premature deaths per year in the Philippines (Health Effects Institute 2019). The Philippines has a stated target, made in the form of its

Intended Nationally Determined Contribution (INDC) as part of the international Paris Agreement, to reduce GHG emissions by 70 percent relative to a “business as usual” scenario by 2030. The Philippines is currently revisiting its INDC in view of finalizing the Nationally Determined Contribution.

Agriculture currently accounts for about one-third of the country’s GHG emissions. Emissions stemming from agriculture are roughly on par with those from the power sector and greater than those from the transport sector. Agriculture-sector emissions are principally due to rice cultivation. In the future, agriculture GHG emissions are likely to grow at most modestly and to be overtaken by emissions from the power and transport sectors.

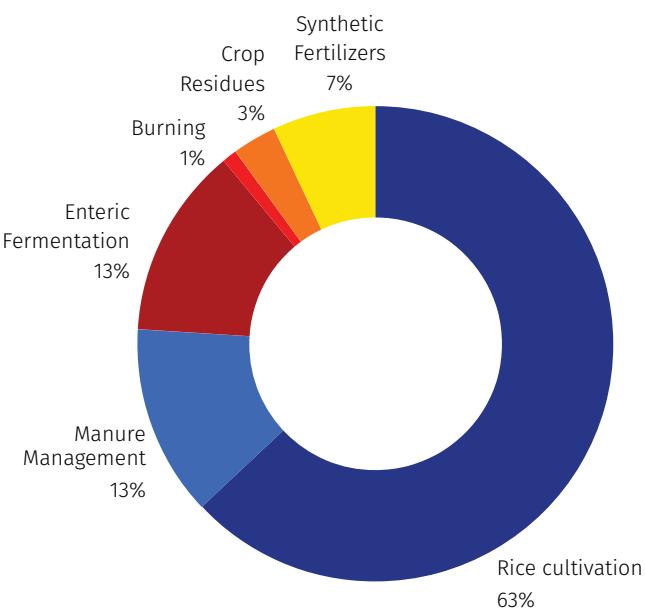
If the Philippines builds new coal-fired power plants, it is unlikely to meet its INDC commitments for 2030. GHG emissions in the energy sector are projected to increase substantially under both the “business-as-usual” and “clean energy” scenarios developed by the Department of Energy (DOE). Under the BAU scenario, GHG emissions due to power generation from coal alone would more than quadruple by 2040 (Figure 66).

Figure 64: Greenhouse Gas Emissions by Major Source



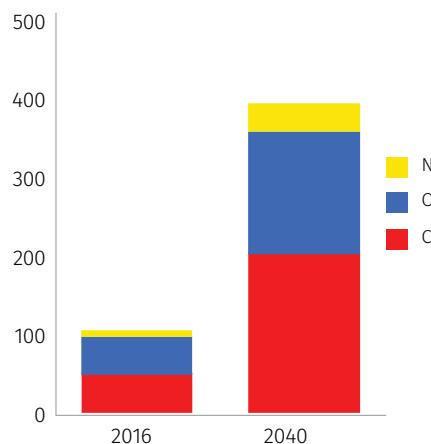
Source: World Resources Institute: CAIT Climate Data Explorer, 2014 estimates.

Figure 65: Agricultural Greenhouse Gas Emissions by Source



Source: FAOSTAT.

Figure 66: 2016 and Projected 2040 Greenhouse Gas Emissions by Fuel Source, Metric Tons of Carbon Dioxide Equivalent



Source: Department of Energy 2017.

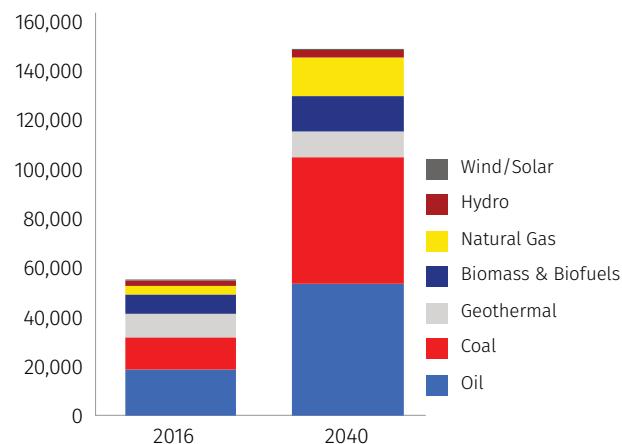
Note: Projections in both figures for 2040 correspond to a “business as usual” scenario.

Total energy use is projected to nearly triple by 2040. To meet demand for the power component of energy consumption, the Philippines has been rapidly expanding coal-fired power production. Oil-based fuel is used for only a small portion of power but accounts for the dominant share of fuel for transport and other energy consumption. The Department of Energy projects that both coal- and oil-based fuel consumption will greatly increase by 2040 (Figure 67).

Worldwide the cost of renewable energy—and particularly solar—is falling rapidly, making coal-based power more expensive. Globally, in 2018, the cost of electricity declined 26 percent year-on-year for concentrated solar power (IRENA 2019). Likewise, construction of coal power plants around the world is slowing rapidly, with new construction dropping by 84 percent between 2015 and 2018 (Shearer et al. 2019). Power plants in the Philippines are typically built with long-term purchase contracts, by which the plant owner is guaranteed to be paid a set price over many years. There is a very high risk that new coal-fired power plants will become “stranded assets” that will lock Filipinos into paying high rates when renewable energy has become cheaper (Ahmed and Logarta 2017).

The Philippines has high potential to move more aggressively toward renewable energy. The government has programs to encourage renewables, but these have stalled in implementation. To satisfy

Figure 67: 2016 and Projected 2040 Energy Supply by Fuel Type, Thousand Tons of Oil Equivalent



energy demand, the country can develop a mix of renewables, including solar, wind, small hydro, biomass, and geothermal. Under one highly ambitious roadmap, with major investment in renewables, the country could achieve zero-carbon power production by 2050 (Figure 68). This would require major shifts including revamping the grid system and building storage capacity. This scenario highlights that prospects are bright for solar to become a major power source for the Philippines. Other recent studies have noted the large untapped potential for rooftop solar, which is discouraged by regulatory requirements (Ahmed 2018; IFC 2019).

The Philippines can meet ambitious NDC commitments and mitigate climate change through action by the government and the private sector.

This will require integrating climate change throughout government planning. While simultaneously satisfying growing energy demand, the country can avoid the construction of any new coal-fired power plants and transition rapidly to renewables. Given the fast-declining price of solar and the country’s untapped potential other renewables a low-carbon future is possible. Other key measures will include improving energy efficiency in public buildings and improving transportation infrastructure. With efforts by the government and the private sector, the Philippines can chart a course for green growth and a sustainable future.

Figure 68: Power Production under a 100 Percent Renewable Scenario for 2050