Climate Change in the Philippines

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ADAPTAYO
OUR NATION'S CALL FOR CLIMATE CHANGE ADAPTATION

MDG-F
MDG ACHIEVEMENT FUND
MDG-F 1656: Strengthening the Philippines' Institutional Capacity to Adapt to Climate Change

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The Philippines is now facing the very real impacts of climate change, which threaten to undermine our development prospects and exacerbate the vulnerability of our poorer communities. With projected changes in precipitation, temperature, intensity of tropical cyclones and frequency of extreme weather events, considerable efforts would be required to prepare the Philippines in dealing with the impacts of climate change on the different climate-sensitive sectors. Adaptation will be an integral part of our response to the threats of climate change.

It is important that we have a scientific basis for adaptation and vulnerability assessment studies. This Report provides us with the opportunity to understand the future changes in climate and how these changes will affect the Philippines in the future. It also illustrates the impacts of climate change on agriculture, human health, water, coastal, and forestry resources as well as adaptation efforts in each sector.

Climate Change in the Philippines is an important document to guide decision-makers in strategic planning and policy formulation.

On behalf of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), I am glad to share the results of **Climate Change in the Philippines.**

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In 2009, the Government of the Philippines initiated the implementation of the Millennium Development Goals Fund (MDGF) Joint Programme entitled "Strengthening the Philippines' Institutional Capacity to Adapt to Climate Change". It is a three-year program funded by the Government of Spain through the United Nations Development Program (UNDP) Philippines and the various UN agencies (UNEP, FAO, WHO, UN Habitat, and others). The three outcomes of this Joint Programme are:

- climate risk reduction mainstreamed into key national and selected local development plans and processes;
- enhanced national and local capacity to develop, manage and administer projects addressing climate change risks; and
- coping mechanisms improved through pilot adaptation projects.

Central to achieving the three outcomes is developing the capacity of local government units in the Philippines to mainstream climate change adaptation in their development plans, programs and activities. Planning for and implementing climate change adaptation will require detailed information on plausible future climates, such as changes in temperatures, rainfall and frequency of extreme weather events. These climate informations, called climate change scenarios, are generated from climate simulations.

Climate change scenarios provide characteristics of plausible future climates and are constructed using climate models. These are either global or regional climate models and are mathematical representations of the climate system which simulate the physical and dynamical processes that determine global/regional climate. There is no certainty as to how emission pathways in the future would go, inasmuch as development pathways in both the developed and developing countries all over the globe are defined by factors such as population and demographic characteristics, access to technology, economic development, energy use and policies pursued, including outcomes of negotiations on greenhouse gas emission reductions.

To generate projections of temperature increase and rainfall change in the Philippines in 2020 and 2050, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) used the PRECIS (Providing Regional Climates for Impact Studies) Regional Climate Model (RCM). This RCM was developed by the UK Met Hadley Centre (in the United Kingdom) to facilitate impact, vulnerability and adaptation assessments in developing countries where capacities to do climate modeling are still not fully developed or do not exist. Three of the emission scenarios developed by the Intergovernmental Panel on Climate Change in its Special Report on Emission Scenarios (IPCC SRES) were chosen to run the models; namely, A2 (high-range), A1B (mid-range), and B2 (low-range). The A2 scenario is at the so-called higher end of the emission scenarios (although not the highest), and is preferred by most countries because from an impacts and adaptation point of view, if man can adapt to a larger climate change, then the smaller climate changes of the lower end scenarios can also be adapted. On the other hand, the A1B scenario is considered because the future climates in the next 30-40 years will be greatly influenced by past emissions, principally due to the long lifetimes of carbon dioxide. The B2 scenario representing the low-range emissions is therefore, the most unlikely, even if it represents the low end.

Main outputs presented in this Report are the projected temperature increase in °C, magnitude and direction of rainfall change in %, and frequency of extreme weather events (e.g., extreme temperature expressed in number of days with maximum temperature greater than 35 °C, dry days indicated by the number of days with less than 2.5mm of rain, and extreme rainfall or number of days with greater than 300mm of rain) in the country.

Highlighted in this Report are the present (baseline) climates, key findings of future climates in 2020 and 2050 in the Philippines under the three emission scenarios, and how would these future climates impact on the different key sectors and systems, including how adaptation could be pursued. The present (baseline) climate gives the current changes in the Philippine climate in terms of temperature, rainfall and extreme events, including tropical cyclone occurrence. The key findings on future climates (e.g., in 2020 and 2050) in each of the provinces are presented in terms of temperature increase and rainfall change by seasons (e.g., DJF or northeast monsoon season, MAM or summer season, JJA or southwest monsoon season, and SON or transition from southwest to northeast monsoon season) and changes in frequency of daily extreme events in graphs and/or tables.

The climate trends were analyzed using available observed data from 1951 to 2009 with the average for the period of 1971 – 2000 as the reference value. The key findings are summarized as follows:

- There has been an increase in annual mean temperature by 0.65°C;
- In terms of maximum and minimum temperatures, the increases have been 0.36 °C and 0.1°C;
- Results of analysis of trends of tropical cyclone occurrence/passage within the so-called Philippine Area of Responsibility (PAR) show that an average of 20 tropical cyclones form and/or cross the PAR per year with strong multi-decadal variability, that there still is no indication of increase in the frequency, but with a very slight increase in the number of tropical cyclones with maximum sustained winds of greater than 150kph and above (typhoon category) being exhibited during El Nino years; and
- The analysis of trends of extreme daily temperatures and extreme daily rainfall indicate significant increase in number of hot days but decrease of cool nights, and those of rainfall (extreme rainfall intensity and frequency) are not clear, both in magnitude (by what amounts) and direction (whether increasing or decreasing), with very little spatial coherence.

For future climates in 2020 and 2050, outputs of the simulations under the mid-range scenario are presented in detail for the sole reason that future climates in the next 30 to 40 years will be greatly influenced by the past greenhouse gas emissions already there (i.e., lifetimes of carbon dioxide are a hundred years or more). The key findings are:

- All areas of the Philippines will get warmer, more so in the relatively warmer summer months;
- Annual mean temperatures (average of maximum and minimum temperatures) in all areas in the country are expected to rise by 0.9 °C to 1.1 °C in 2020 and by 1.8 °C to 2.2 °C in 2050;

- Likewise, all seasonal mean temperatures will also have increases in the two time slices (presented in tables), and these increases during the four seasons (e.g., DJF, MAM, JJA and SON) are quite consistent in all the provinces;

- In terms of seasonal rainfall change, generally, there is a substantial spatial difference in the projected changes in rainfall in 2020 and 2050 in most parts of the Philippines, with reduction in rainfall in most provinces during the summer season (MAM) making the usually dry season drier , while rainfall increases are likely in most areas of Luzon and Visayas during the southwest monsoon (JJA) and the SON seasons, making these seasons still wetter, and thus with likelihood of both droughts and floods in areas where these are projected;

- The northeast monsoon (DJF) season rainfall is projected to increase, particularly for areas characterized by Type II climate with potential for more flooding ;

- During the southwest monsoon season (JJA), larger increases in rainfall is expected in provinces in Luzon (0.9% to 63%) and Visayas (2% to 22%) but generally decreasing trends in most of the provinces in Mindanao in 2050;

- However, projections for extreme events in 2020 and 2050 show that hot temperatures (indicated by the number of days with maximum temperature exceeding 35 °C) will continue to become more frequent, number of dry days (days with less than 2.5mm of rain) will increase in all parts of the country and heavy daily rainfall (exceeding 300mm) events will also continue to increase in number in Luzon and Visayas.

Because projections detailed in the key findings in the national and those in the local (provincial) scales are those of the mid-range scenario (deemed the likely emission scenario in 2020 and 2050), the projections for temperature increase, rainfall change and projected frequency of extreme temperature and extreme rainfall under the high and the low scenarios in the two time frames are presented in tables and graphs in the Technical Annexes.

The response in the Philippine climate to the three emission scenarios as can be seen (Fig.23) indicate that the projected temperature increase under all three will only start to diverge during the middle of this century, despite the vast differences in the characteristics of these scenarios. In fact, projected temperature increase in 2020 under the mid-range scenario ranges from 0.7 °C to 1.2 °C, while that of the high-range is from 0.5 °C to 0.9 °C, and of the low-range is from 0.1°C to 0.9°C. In 2050, the temperature increase under mid-range scenario is from 1.5 °C to 2.4°C while that of the high-range is from 1.2 °C to 2.1 °C, and the low-range is from 0.6 °C to 2.1 °C. It is further indicated that by 2100, the high scenario-projected temperature increase is then likely to approach as much as 3.4 °C, while that of the mid-range, 3.1 °C and for the low range, 2.5 °C. This is a clear indication that due to past emissions already there in the atmosphere, temperatures continue to increase until such time that the atmosphere stabilizes.

The observed changes in climate in most recent times have never been seen in the past 140 years. Worse, our current climate (in particular, the increasing frequency of extreme events) has already been observed to impact adversely on lives, health and well-being, the environment and the economy (SNC, 2010). As has been reported in the IPCC AR4, a warmer world is certain to multiply the observed adverse impacts, even in the near future. Despite adaptation taking place, albeit autonomous, planned proactive adaptation is being recommended in order to “climate-proof” development plans, projects and activities.

What does it take to have planned proactive adaptation? Projections of future climates are the basis for climate change adaptation and disaster risk reduction planning. Those science-based informations are the prerequisites for impact, vulnerability and adaptation assessments which will allow a quantification of climate risks we face in the future. Opportunities/challenges and key “climate hotspots” along with low- and high-risk areas in the key sectors (e.g., water and coastal resources, agriculture, forestry, and human health) could then be identified early to assist decision/policy makers in managing the risks through measures that mitigate adverse impacts, and also, take advantage of potential benefits.

This Chapter provides an overview of:

- How climate change scenarios were developed;
- How the downscaling techniques were applied using the PRECIS RCM outputs;
- How the uncertainties in the modelling outputs were dealt with;
- The level of confidence in the climate projections; and
- Possible applications of these model-generated climate scenarios.

Climate change is happening now. Evidences being seen support the fact that the change cannot simply be explained by natural variation. The most recent scientific assessments have confirmed that this warming of the climate system since the mid-20th century is most likely to be due to human activities; and thus, is due to the observed increase in greenhouse gas concentrations from human activities, such as the burning of fossil fuels and land use change. Current warming has increasingly posed quite considerable challenges to man and the environment, and will continue to do so in the future. Presently, some autonomous adaptation is taking place, but we need to consider a more pro-active adaptation planning in order to ensure sustainable development.

What does it take to ensure that adaptation planning has a scientific basis? Firstly, we need to be able to investigate the potential consequences of anthropogenic or human–induced climate change and to do this, a plausible future climate based on a reliable and accurate baseline (or present) climate must be constructed. This is what climate scientists call a climate change scenario. It is a projection of the response of the climate system to future emissions or concentrations of greenhouse gases and aerosols, and is simulated using climate models. Essentially, it describes possible future changes in climate variables (such as temperatures, rainfall, storminess, winds, etc.) based on baseline climatic conditions.

The climate change scenarios outputs (projections) are an important step forward in improving our understanding of our complex climate, particularly in the future. These show how our local climate could change dramatically should the global community fail to act towards effectively reducing greenhouse gas emissions.

1.1 How the climate change scenarios were developed?

As has been previously stated, climate change scenarios are developed using climate models (UNFCCC). These models use mathematical representations of the climate system, simulating the physical and dynamical processes that determine global/regional climate. They range from simple, one-dimensional models to more complex ones such as global climate models (known as GCMs), which model the atmosphere and oceans, and their interactions with land surfaces. They also model change on a regional scale (referred to as regional climate models), typically estimating change in areas in grid boxes that are approximately several hundred kilometers wide. It should be noted that GCMs/RCMs provide only an average change in climate for each grid box, although realistically climates can vary considerably within each grid.

Climate models used to develop climate change scenarios are run using different forcings[1] such as the changing greenhouse gas concentrations. These emission scenarios known as the SRES (Special Report on Emission Scenarios) developed by the Intergovernmental Panel on Climate Change (IPCC) to give the range of plausible future climate. These emission scenarios cover a range of demographic, societal, economic and technological storylines[2]. They are also sometimes referred to as emission pathways. Table 1 presents the four different storylines (A1, A2, B1 and B2) as defined in the IPCC SRES.

Table1: The four storylines developed by the Intergovernmental Panel on Climate Change (IPCC) which defines plausible emission scenarios.

Storyline	Description
A1	Very rapid economic growth; population peaks mid-century; social, cultural and economic convergence among regions; market mechanisms dominate. Subdivisions: A1FI - reliance on fossil fuels; A1T - reliance on non-fossil fuels; A1B - a balance across all fuel sources
A2	Self-reliance; preservation of local identities; continuously increasing population; economic growth on regional scales
B1	Clean and efficient technologies; reduction in material use; global solutions to economic, social and environmental sustainability; improved equity; populations peaks mid-century
B2	Local solutions to sustainability; continuously increasing population at a lower rate than in A2; less rapid technological change than in B1 and A1

Climate change is driven by factors such as changes in the atmospheric concentration of greenhouse gases and aerosols, land cover and radiation, and their combinations, which then result in what is called radiative forcing (positive or warming and negative or cooling effect). We do not know how these different drivers will specifically affect the future climate, but the model simulation will provide estimates of its plausible ranges.

A number of climate models have been used in developing climate scenarios. The capacity to do climate modeling usually resides in advanced meteorological agencies and in international research laboratories for climate modeling such as the Hadley Centre for Climate Prediction and Research of the UK Met Office (in the United kingdom), the National Center for Atmospheric Research and the Geophysical Fluid Dynamics Laboratory (in the United States), the Max Planck Institute for Meteorology (in Germany), the Canadian Centre for Climate Modeling and Analysis (in Canada), the Commonwealth Scientific and Industrial Research Organization (in Australia), the Meteorological Research Institute of the Japan Meteorological Agency (in Japan), and numerous others. These centers have been developing their climate models and continuously generate new versions of these models in order address the limitations and uncertainties inherent in models.

[1] Forcings is the term used for factors that drive the climate models. These factors include the increasing concentrations of greenhouse gases, aerosols, combination of both and others.

[2] Storylines are narrative descriptions of scenarios, defining the main characteristics and dynamics, and the relationships between the key drivers of the scenarios (e.g., social, economic, technological and environmental developments for large world regions and globally during the 21st century).

For the climate change scenarios in the Philippines presented in this Report, the PRECIS RCM was used. It is a PC-based regional climate model developed at the UK Met Office Hadley Centre for Climate Prediction and Research to facilitate impact, vulnerability and adaptation assessments in developing countries where capacities to do modeling are limited. Two time slices centered on 2020 (2006-2035) and 2050 (2036-2065) were used in the climate simulations using three emission scenarios; namely, the A2 (high-range emission scenario), the A1B (medium- range emission scenario) and the B2 (low-range emission scenario).

The high-range emission scenario connotes that society is based on self-reliance, with continuously growing population, a regionally-oriented economic development but with fragmented per capita economic growth and technological change. On the other hand, the mid-range emission scenario indicates a future world of very rapid economic growth, with the global population peaking in mid-century and declining thereafter and there is rapid introduction of new and more efficient technologies with energy generation balanced across all sources. The low-range emission scenario, in contrast, indicates a world with local solutions to economic, social, and environmental sustainability, with continuously increasing global population, but at a rate lower than of the high-range, intermediate levels of economic development, less rapid and more diverse technological change but oriented towards environment protection and social equity.

To start the climate simulations or model runs, outputs (climate information) from the relatively coarse-resolution GCMs are used to provide high-resolution (using finer grid boxes, normally 10km-100km) climate details, through the use of downscaling techniques. Downscaling is a method that derives local to regional scale (10km-100km x 10km-100km – grids) information from larger-scale models (150km-300km x 150km-300km – grids) as shown in Fig.1. The smaller the grid, the finer is the resolution giving more detailed climate information. Fig.2 shows the representation of the Philippines at different model resolutions.

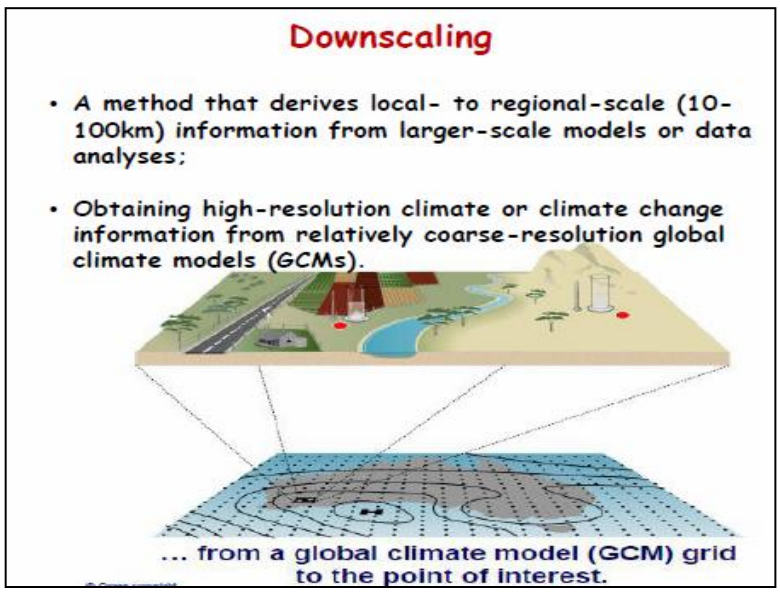
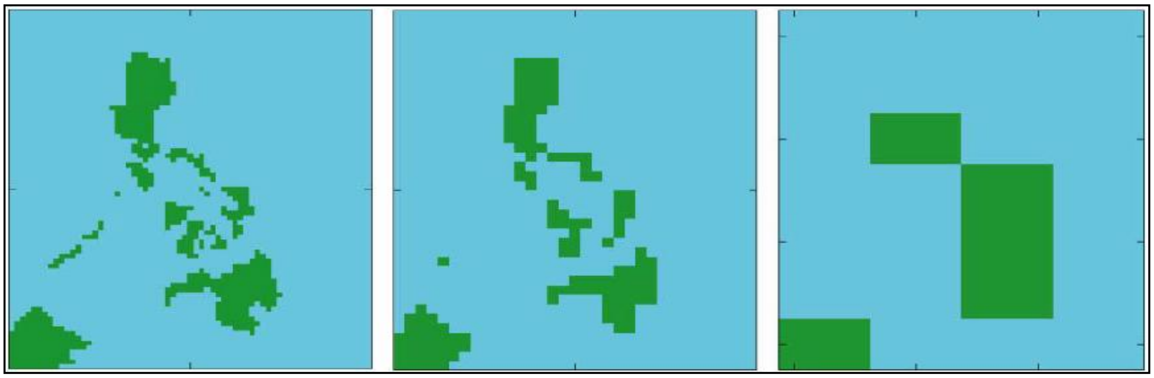


Fig.1: Downscaling defined as the process through which high-resolution climate/climate change information are obtained from coarse-resolution global climate models.



Source: Generating High Resolution Climate Change Scenarios using PRECIS, April 2004

25km 50km 300km

Fig.2: Representations of the Philippines using three resolutions; 25km x 25km, 50km x 50km, and 300km x 300km grids, respectively. There are finer details as the grid gets smaller.

The climate simulations presented in this report used boundary data that were from the ECHAM4 and HadCM3Q0.

1.2 How were the downscaling techniques applied using the PRECIS RCM?

To run regional climate models, boundary conditions are needed in order to produce local climate scenarios. These boundary conditions are outputs of the GCMs. For the PRECIS RCM, the following boundary data and control runs were used:

- For the high-range scenario, the GCM boundary data used was from ECHAM4. This is the 4th generation coupled ocean-atmosphere general circulation model, which uses a comprehensive parameterization package developed at the Max Planck Institute for Meteorology in Hamburg, Germany. Downscaling was to a grid resolution of 25km x 25km; thus, allowing more detailed regional information of the projected climate. Simulated baseline climate used for evaluation of the model's capacity of reproducing present climate was the 1971-2000 model run. Its outputs were compared with the 1971-2000 observed values.

- For the mid-range scenario, the GCM boundary data was from the HadCM3Q0 version 3 of the coupled model developed at the Hadley Centre. Downscaling was also to a grid resolution of 25km x 25km and the same validation process was undertaken.

- For running the low-range scenario, the same ECHAM4 model was used. However, the validation process was only for the period of 1989 to 2000 because the available GCM boundary data in the model was limited to this period.

The simulations for all 3 scenarios were for three periods; 1971 to 2000, 2020 and 2050. The period 1971 to 2000 simulation is referred to as the baseline climate, outputs of which are used to evaluate the model's capacity of reproducing present climate (in other words, the control run). By comparing the outputs (i.e., temperature and rainfall) with the observed values for the 1971 to 2000 period, the model's ability to realistically represent the regional climatological features within the country is verified. The differences between the outputs and the observed values are called the biases[3] of the model. The 2020 and 2050 outputs are then mathematically corrected, based on the comparison of the model's performance.

The main outputs of the simulations for the three SRES scenarios (high-range, mid-range and low-range) are the following:

- projected changes in seasonal and annual mean temperature;
- projected changes in minimum and maximum temperatures;
- projected changes in seasonal rainfall; and
- projected frequency of extreme events.

The seasonal variations are as follows:

- the DJF (December, January, February or northeast monsoon locally known as amihan) season;
- the MAM (March, April, May or summer) season;
- the JJA (June, July, August or southwest monsoon season, or "habagat") season; and
- the SON (September, October, November or transition from southwest to northeast monsoon) season.

On the other hand, extreme events are defined as follows:

- extreme temperature (assessed as number of days with maximum temperature greater than 35 °C, following the threshold values used in other countries in the Asia Pacific region);
- dry days (assessed as number of dry days or day with rainfall equal or less than 2.5mm/day, following the World Meteorological Organization standard definition of dry days used in a number of countries); and
- extreme rainfall (assessed as number of days with daily rainfall greater than 300mm, which for wet tropical areas, like the Philippines, is considerably intense that could trigger disastrous events).

1.3 How were the uncertainties in the modeling simulations dealt with?

Modeling of our future climate always entails uncertainties. These are inherent in each step in the simulations/modeling done because of a number of reasons. Firstly, emissions scenarios are uncertain. Predicting emissions is largely dependent on how we can predict human behavior, such as changes in population, economic growth, technology, energy availability and national and international policies (which include predicting results of the international negotiations on reducing greenhouse gas emissions). Secondly, current understanding of the carbon cycle and of sources and sinks of non-carbon greenhouse gases are still incomplete. Thirdly, consideration of very complex feedback processes in the climate system in the climate models used can also contribute to the uncertainties in the outputs generated as these could not be adequately represented in the models.

[3] Biases are the differences between the observed climate and the outputs of the control run. In the climate simulations done, the control run was 1971-2000, unless otherwise stated.

But while it is difficult to predict global greenhouse gas emission rates far into the future, it is stressed that projections for up to 2050 show little variation between different emission scenarios, as these near-term changes in climate are strongly affected by greenhouse gases that have already been emitted and will stay in the atmosphere for the next 50 years. Hence, for projections for the near-term until 2065, outputs of the mid-range emission scenario are presented in detail in this Report.

Ideally, numerous climate models and a number of the emission scenarios provided in the SRES should be used in developing the climate change scenarios in order to account for the limitations in each of the models used, and the numerous ways global greenhouse gas emissions would go. The different model outputs should then be analyzed to calculate the median of the future climate projections in the selected time slices. By running more climate models for each emission scenarios, the higher is the statistical confidence in the resulting projections as these constitute the ensemble representing the median values of the model outputs.

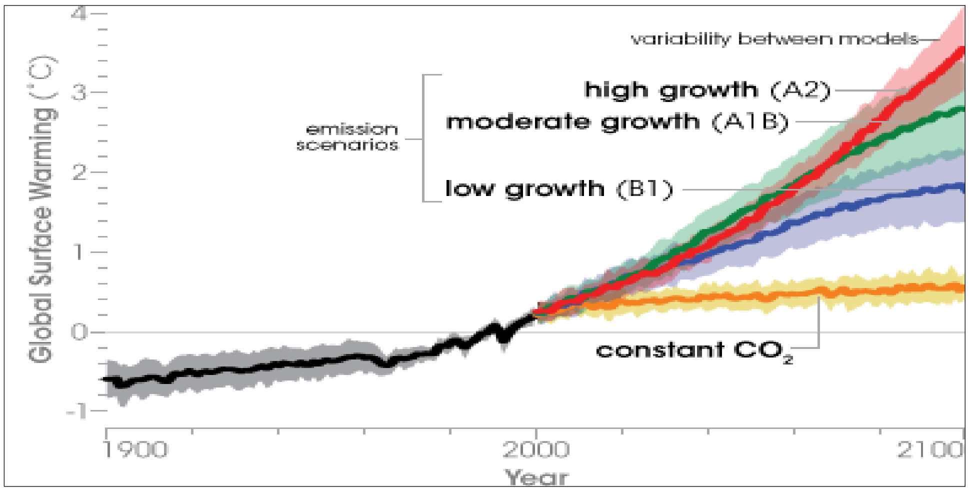
The climate projections for the three emission scenarios were obtained using the PRECIS RCM however there are some limitations during the simulations. These constraints and limitations are:

- Limited models that can be downscaled in the PRECIS RCM;
- Time constraints -10 year simulation take a month or more; This had been partly addressed under the capacity upgrading initiatives being implemented by the MDGF Joint Programme which include procurement of more powerful computers and acquiring new downscaling techniques. Improved equipment and new techniques have reduced the computing time requirements to run the models. However, additional time is still needed to run the models using newly acquired downscaling techniques.
- Resolution of 25 km insufficient for some impact application (e.g.catchment-scale hydrology)

The PAGASA strives to improve confidence in the climate projections and is continuously exerting efforts to upgrade its technical capacities and capabilities. Models are run as soon as these are acquired with the end-goal of producing an ensemble of the projections. Updates on the projections, including comparisons with the current results, will be provided as soon as these are available.

1.4 What is the level of confidence in the climate projections?

The IPCC stresses that there is a large degree of uncertainty in predicting what the future world will be despite taking into account all reasonable future developments. Nevertheless, there is high confidence in the occurrence of global warming due to emissions of greenhouse gases caused by humans, as affirmed in the IPCC Fourth Assessment Report (AR4). Global climate simulations done to project climate scenarios until the end of the 21st century indicate that, although there are vast differences between the various scenarios, the values of temperature increase begin to diverge only after the middle of this century (shown in Fig.3). The long lifetimes of the greenhouse gases (in particular, that of carbon dioxide) already in the atmosphere is the reason for this behavior of this climate response to largely varying emission scenarios.



Source: NASA Earth Observatory, based on IPCC Fourth Assessment Report (2007)

Fig. 3: Temperature projections to the year 2100, based on a range of emission scenarios and global climate models. Scenarios that assume the highest growth in greenhouse gas emissions provide the estimates in the top end of the temperature range. The orange line ("constant CO_2") projects global temperatures with greenhouse gas concentrations stabilized at year 2000 levels.

Model outputs that represent the plausible local climate scenarios in this Report are indicative to the extent that they reflect the large-scale changes (in the regional climate model used) modified by the projected local conditions in the country.

It also should be stressed further that confidence in the climate change information depends on the variable being considered (e.g., temperature increase, rainfall change, extreme event indices, etc.). In all the model runs regardless of emission scenarios used, there is greater confidence in the projections of mean temperature than that of the others. On the other hand, projections of rainfall and extreme events entail consideration of convective processes which are inherently complex, and thus, limiting the degree of confidence in the outputs.

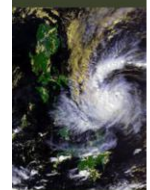
1.5 What are the possible applications of these model-generated climate scenarios?

Climate scenarios are commonly required in climate change impact, vulnerability and adaptation assessments to provide alternative views of future conditions considered likely to affect society, systems and sectors, including a quantification of climate risks, challenges and opportunities. Climate scenario outputs could be used in any of the following:

- to illustrate projected climate change in a given administrative region/province;
- to provide data for impact/adaptation assessment studies;
- to communicate potential consequences of climate change (e.g., specifying a future changed climate to estimate potential shifts in say, vegetation, species threatened or at risk of extinction, etc.); and
- for strategic planning (e.g., quantifying projected sea level rise and other climate changes for the design of coastal infrastructure/defenses such as sea walls, etc.).

Chapter 2

Current Climate and Observed Trends in the Philippines



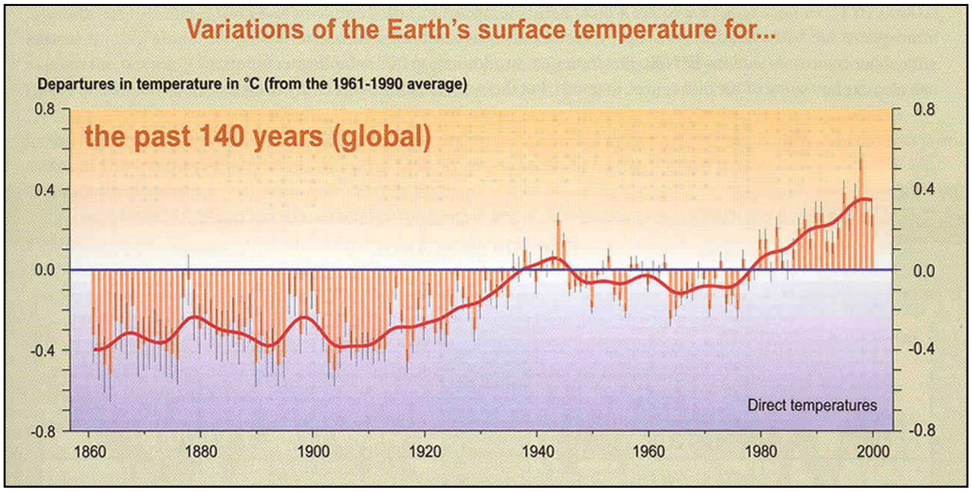
This Chapter provides an overview of:

- Key findings of the IPCC AR4;
- Current observed trends in the Philippines:
  - rainfall;
  - temperature;
  - tropical cyclones; and
  - extreme events

The world has increasingly been concerned with the changes in our climate due largely to adverse impacts being seen not just globally, but also in regional, national and even, local scales. In 1988, the United Nations established the IPCC to evaluate the risks of climate change and provide objective information to governments and various communities such as the academe, research organizations, private sector, etc. The IPCC has successively done and published its scientific assessment reports on climate change, the first of which was released in 1990. These reports constitute consensus documents produced by numerous lead authors, contributing authors and review experts representing Country Parties of the UNFCCC, including invited eminent scientists in the field from all over the globe.

In 2007, the IPCC made its strongest statement yet on climate change in its Fourth Assessment Report (AR4), when it concluded that the warming of the climate system is unequivocal, and that most of the warming during the last 50 years or so (e.g., since the mid-20th century) is due to the observed increase in greenhouse gas concentrations from human activities. It is also very likely that changes in the global climate system will continue into the future, and that these will be larger than those seen in our recent past (IPCC, 2007a).

Fig.4 shows the 0.74 °C increase in global mean temperature during the last 150 years compared with the 1961-1990 global average. It is the steep increase in temperature since the mid-20th century that is causing worldwide concern, particularly in terms of increasing vulnerability of poor developing countries, like the Philippines, to adverse impacts of even incremental changes in temperatures.



Source: IPCC AR4

Fig.4: Global mean temperature anomalies since the mid-19th century compared with the 1961-1990 average.

The IPCC AR4 further states that the substantial body of evidence that support this most recent warming includes rising surface temperature, sea level rise and decrease in snow cover in the Northern Hemisphere (shown in Fig.5).

Additionally, there have been changes in extreme events globally and these include;

- widespread changes in extreme temperatures observed;
- cold days, cold nights and frost becoming less frequent;
- hot days, hot nights and heat waves becoming more frequent; and
- observational evidence for an increase of intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures (SSTs).

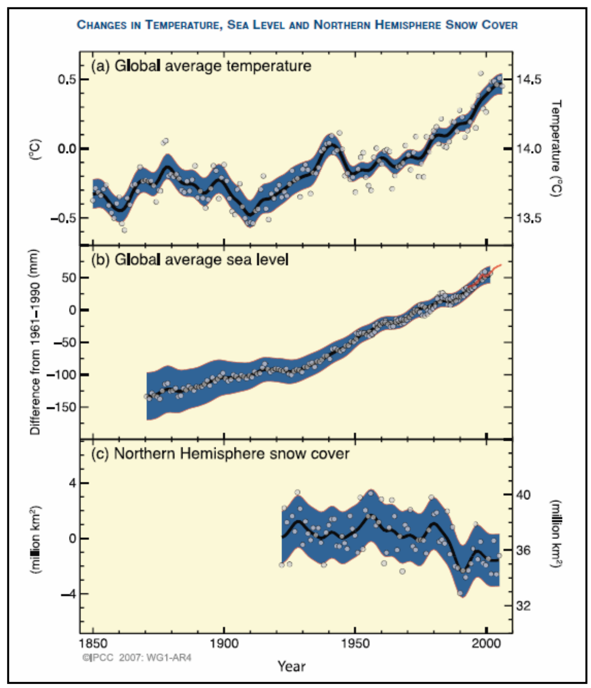


Fig.5: Changes in temperatures, sea level and Northern Hemisphere snow cover since the mid-19th century. The steep increases in global surface temperatures and relative sea level have not been seen during the last 1000 years.

However, there are differences between and within regions. For instance, in the Southeast Asia region which includes Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, among others, temperature increases have been observed; although magnitude varies from one country to another. Changes in rainfall patterns, characteristically defined by changes in monsoon performance, have also been noted. Analysis of trends of extreme daily events (temperatures and rainfall) in the Asia Pacific region (including Australia and New Zealand, and parts of China and Japan) also indicate spatial coherence in the increase of hot days, warm nights and heat waves, and the decrease of cold days, cold nights and frost; although, there is no definite direction of rainfall change across the entire region (Manton et. al., 2001).

2.1 Current climate trends in the Philippines

The Philippines, like most parts of the globe, has also exhibited increasing temperatures as shown in Fig.6 below. The graph of observed mean temperature anomalies (or departures from the 1971-2000 normal values) during the period 1951 to 2010 indicate an increase of 0.65 °C or an average of 0.0108 °C per year-increase.

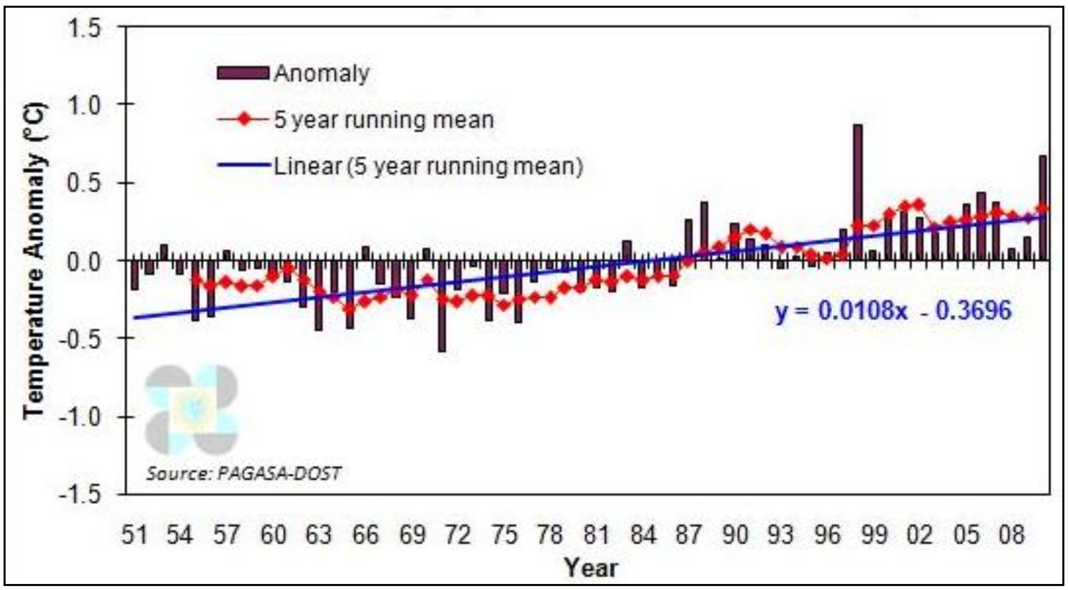


Fig.6: Observed annual mean temperature anomalies (1951-2010) in the Philippines based on 1971-2000 normal values.

The increase in maximum (or daytime) temperatures and minimum (or night time) temperatures are shown in Fig.7 and Fig.8. During the last 60 years, maximum and minimum temperatures are seen to have increased by 0.36 °C and 1.0 °C, respectively.

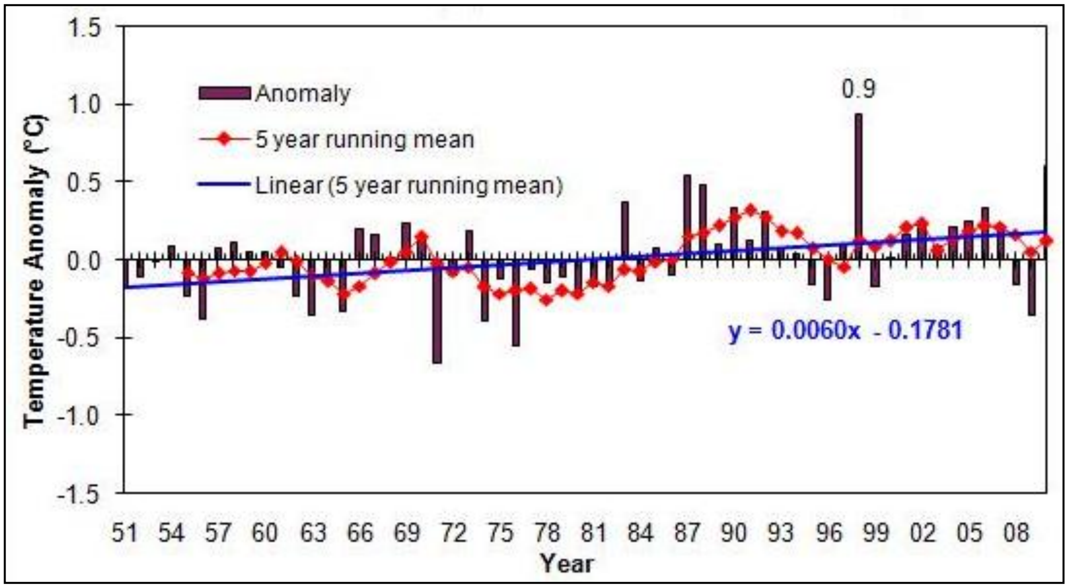


Fig.7: Observed mean annual maximum temperature anomalies in the Philippines during the 1951-2010 period (compared with the 1971-2000 normal values).

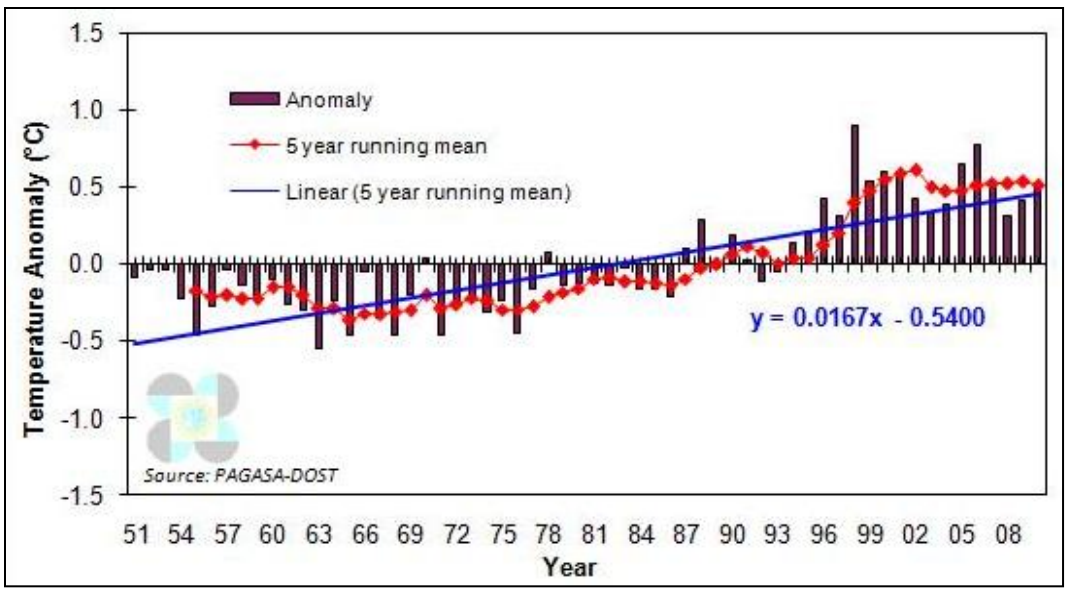


Fig.8: Observed mean annual minimum temperature anomalies in the Philippines during the 1951-2010 period (compared with 1971-2000 mean values).

Analysis of trends of tropical cyclone occurrence or passage within the so-called Philippine Area of Responsibility (PAR) show that an average of 20 tropical cyclones form and/or cross the PAR per year. The trend shows a high variability over the decades but there is no indication of increase in the frequency. However, there is a very slight increase in the number of tropical cyclones with maximum sustained winds of greater than 150kph and above (typhoon category) being exhibited during El Niño event (See Fig.10).

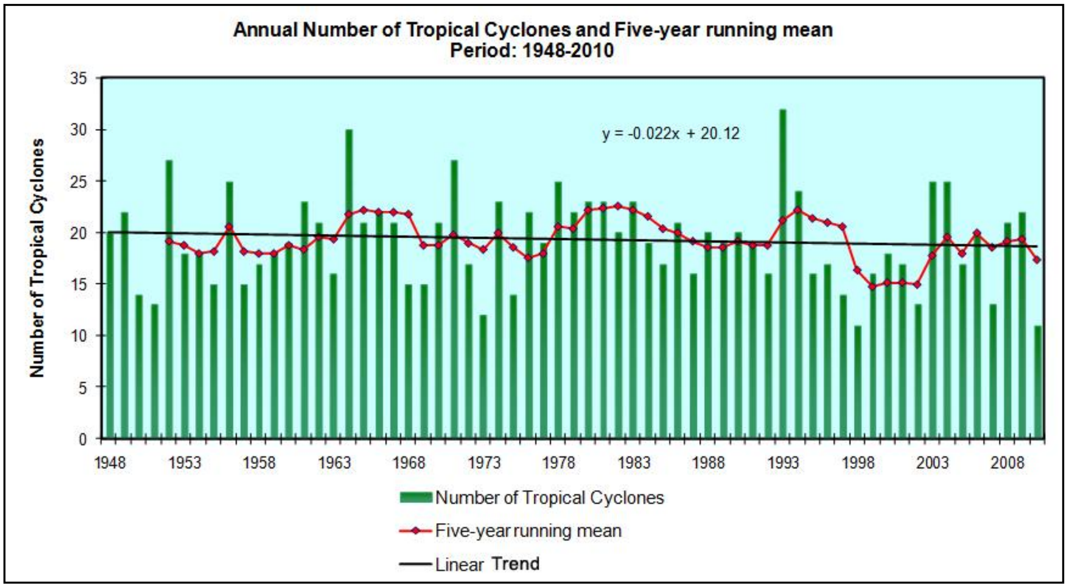


Fig.9: Tropical cyclone occurrence/passage within the Philippine Area of Responsibility during the 1948-2010 period.

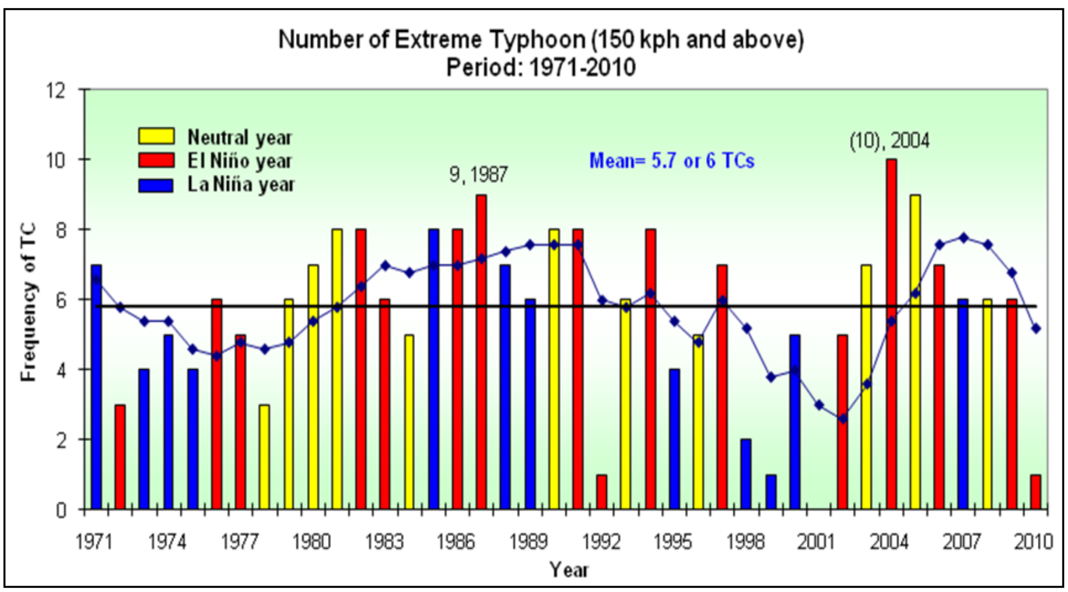


Fig.10: Trend analysis of tropical cyclones with maximum sustained winds of 150kph and above (typhoon category) during the 1971-2010 period).

Moreover, the analysis on tropical cyclone passage over the three main islands (Luzon, Visayas and Mindanao), the 30-year running means show that there has been a slight increase in the Visayas during the 1971 to 2000 as compared with the 1951 to 1980 and 1960-1990 periods (See Fig.11).

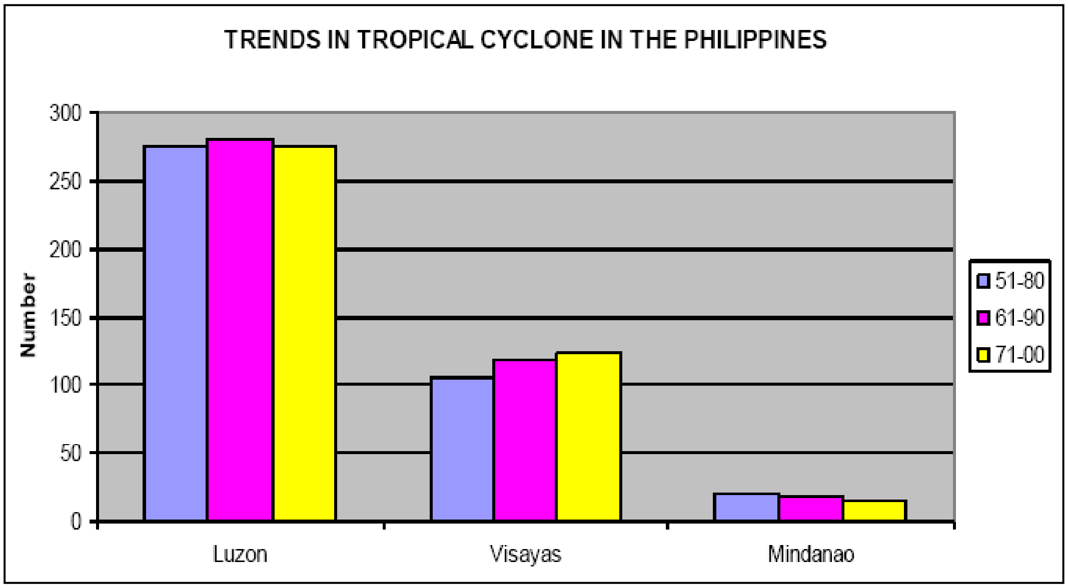


Fig.11: Decadal changes in intense tropical cyclone occurrence in the three main islands in the Philippines(1951-2000).

To detect trends in extreme daily events, indices had been developed and used. Analysis of extreme daily maximum and minimum temperatures (hot-days index and cold-nights index, respectively) show there are statistically significant increasing number of hot days but decreasing number of cool nights (as shown in Fig.12 and Fig.13).

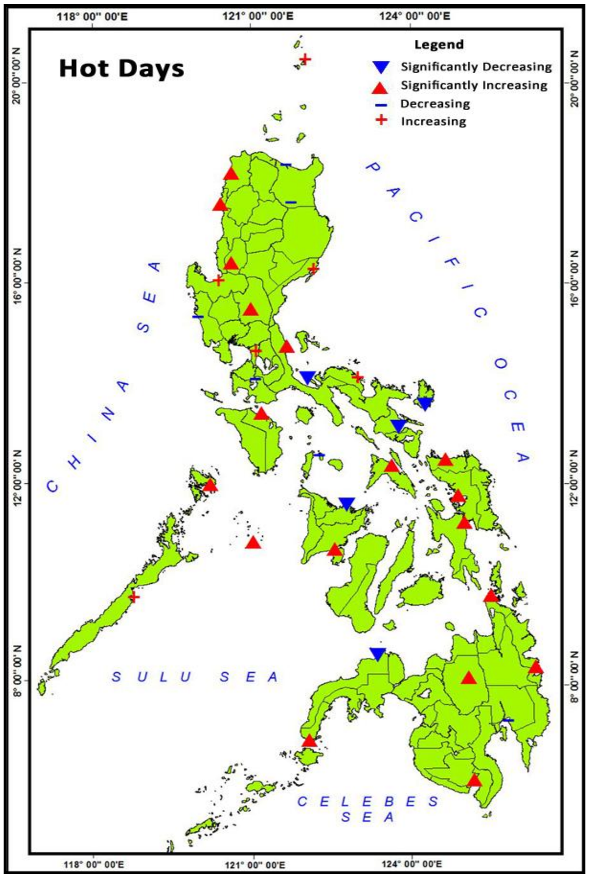


Fig.12: Trends in the frequency of days with maximum temperature above the 1971-2000 mean 99th percentile.

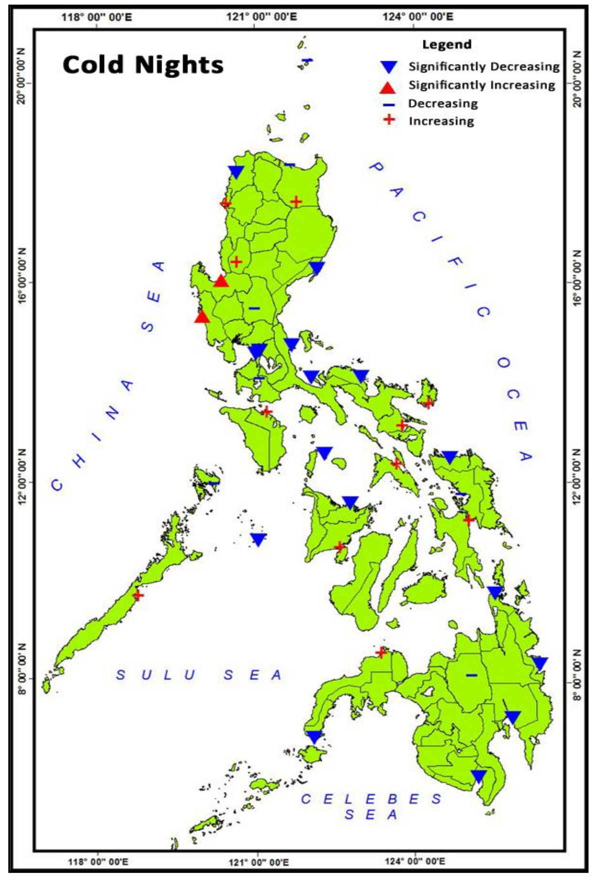


Fig.13: Trends in the frequency of days with minimum temperature below the 1971-2000 mean 1st percentile.

However, the trends of increases or decreases in extreme daily rainfall are not statistically significant; although, there have been changes in extreme rain events in certain areas in the Philippines. For instance, intensity of extreme daily rainfall is already being experienced in most parts of the country, but not statistically significant (see in Fig.14). Likewise, the frequency has exhibited an increasing trend, also, not statistically significant (as shown in Fig.15).

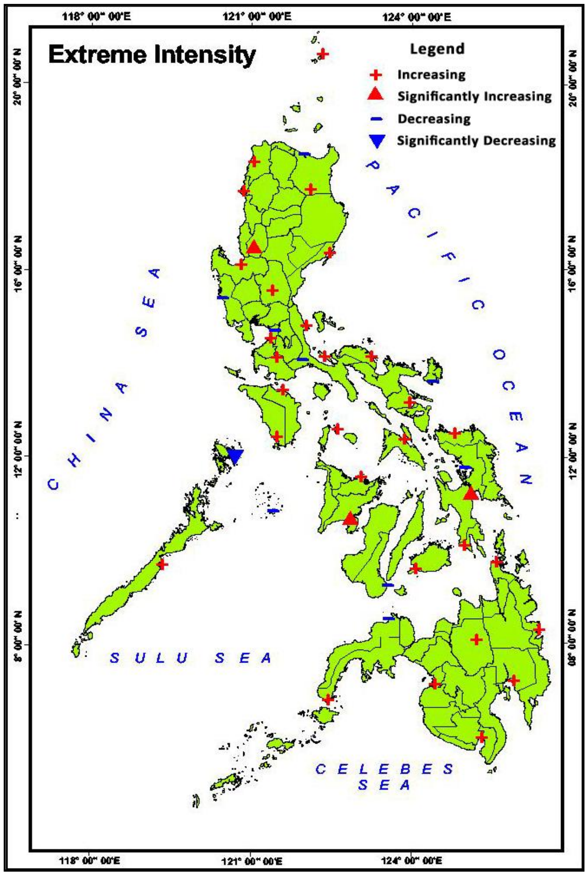


Fig.14: Trends in extreme daily rainfall intensity in the Philippines (1951-2008) compared with the 1971-2000 mean values. Index used is the amount of rainfall exceeding the top four events during the year.

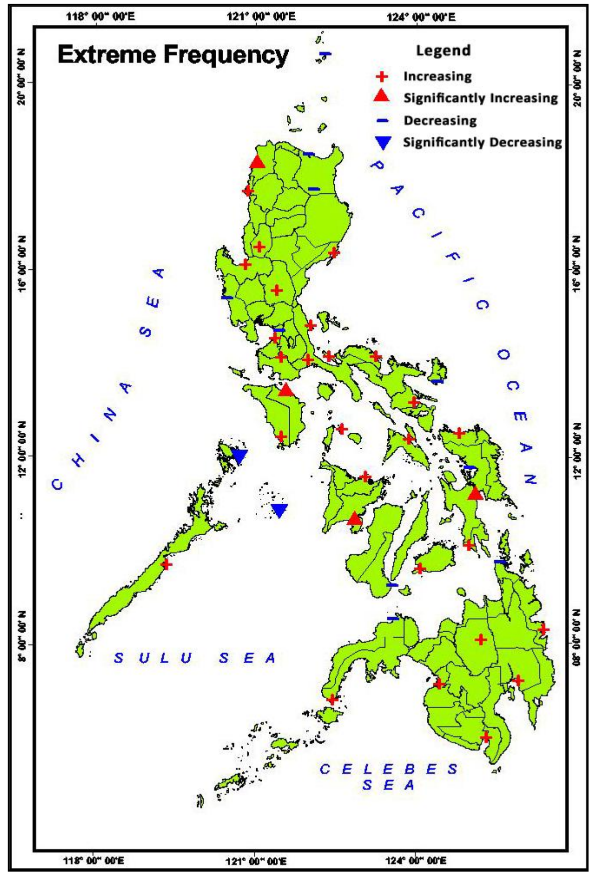
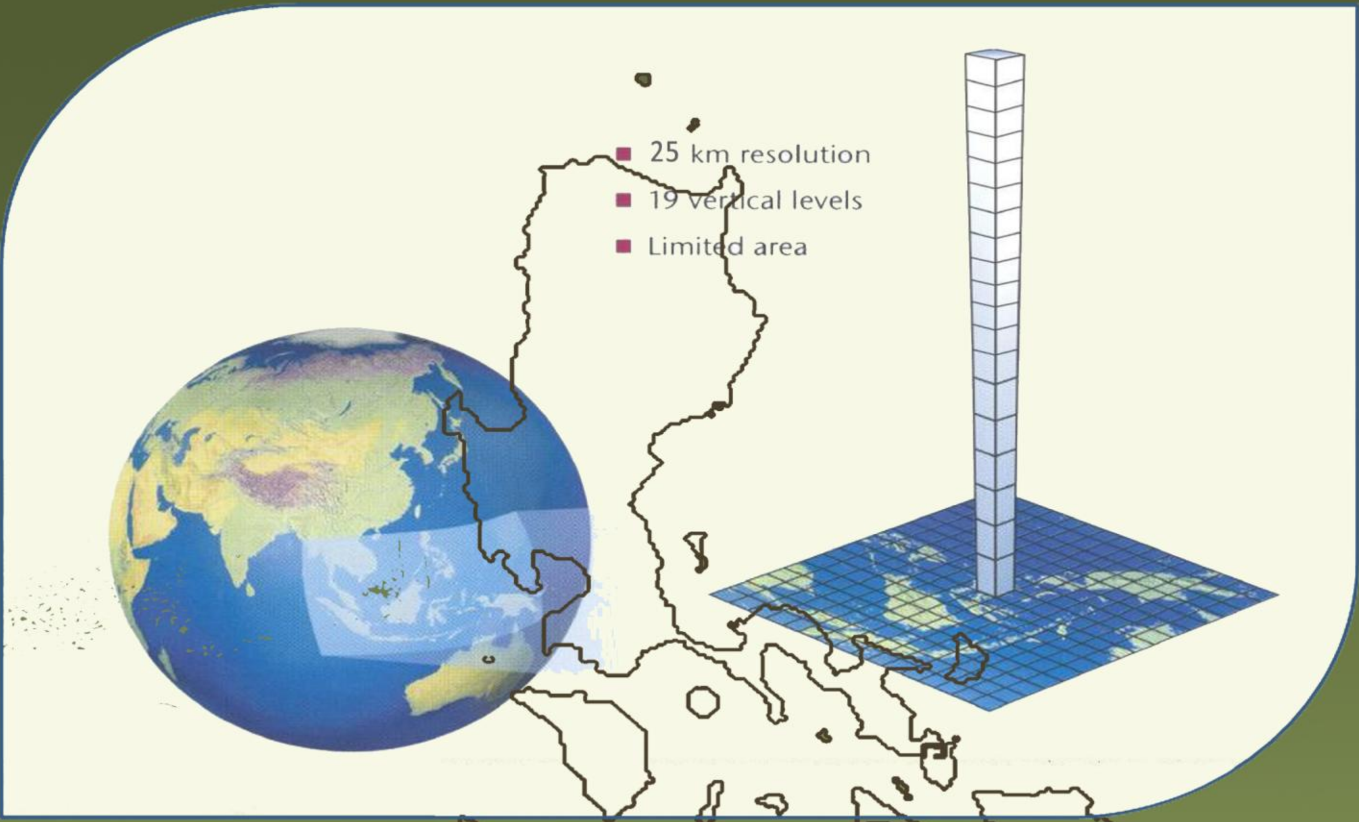


Fig.15: Trends of extreme daily rainfall frequency in the Philippines (1951-2008) compared with the 1971-2000 mean value. Index used is the number of days with rainfall exceeding the top four events during the year.

The rates of increases or decreases in the trends are point values (i.e., specific values in the synoptic weather stations only) and are available at PAGASA, if needed.



Chapter 3

Climate Projections in the Philippines

This Chapter provides an overview of:

- Likely future climate changes in the Philippines in terms of seasonal values of:
  - temperature;
  - rainfall; and
  - extreme events

Projections on seasonal temperature increase and rainfall change, and total frequency of extreme events nationally and in the provinces using the mid-range scenario outputs are presented in this chapter. A comparison of these values with the high- and low- range scenarios in 2020 and 2050 is provided in the technical annexes.

It is to be noted that all the projected changes are relative to the baseline (1971-2000) climate. For example, a projected 1.0 °C-increase in 2020 in a province means that 1.0 °C is added to the baseline mean temperature value of the province as indicated in the table to arrive at the value of projected mean temperature. Therefore, if the baseline mean temperature is 27.8 °C, then the projected mean temperature in the future is (27.8 °C + 1.0 °C) or 28.8 °C.

In a similar manner, for say, a +25%-rainfall change in a province, it means that 25% of the seasonal mean rainfall value in the said province (from table of baseline climate) is added to the mean value. Thus, if the baseline seasonal rainfall is 900mm, then projected rainfall in the future is 900mm + 225mm or 1125mm.

This means that we are already experiencing some of the climate change shown in the findings under the mid-range scenario, as we are now into the second decade of the century.

Classification of climate used the Corona's four climate types (Types I to IV), based on monthly rainfall received during the year. A province is considered to have Type I climate if there is a distinct dry and a wet season; wet from June to November and dry, the rest of the year. Type II climate is when there is no dry period at all throughout the year, with a pronounced wet season from November to February. On the other hand, Type III climate is when there is a short dry season, usually from February to April, and Type IV climate is when the rainfall is almost evenly distributed during the whole year. The climate classification in the Philippines is shown in Fig.16.

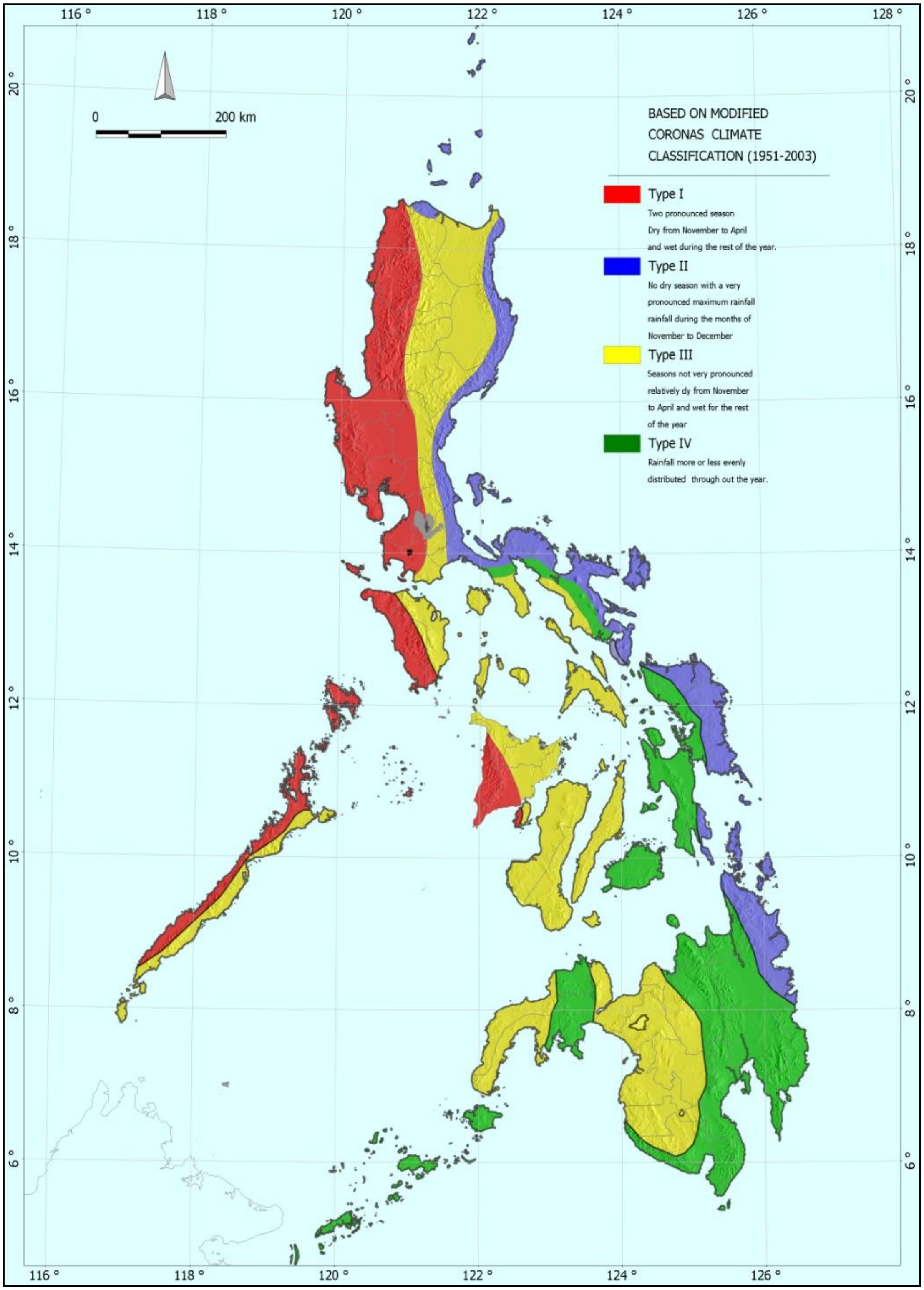


Fig.15: Climate map of the Philippines

3.1 Seasonal Temperature Change: all areas of the Philippines will get warmer, more so in the relatively warmer summer months.

Mean temperatures in all areas in the Philippines are expected to rise by 0.9 °C to 1.1 °C in 2020 and by 1.8 °C to 2.2 °C in 2050. Likewise, all seasonal mean temperatures will also have increases in these time slices; and these increases during the four seasons are quite consistent in all parts of the country. Largest temperature increase is projected during the summer (MAM) season.

Fig.17: Maps showing the projected seasonal temperature increase (in °C) in the Philippines in 2020 and 2050.

3.2 Seasonal Rainfall Change: generally, there is reduction in rainfall in most parts of the country during the summer (MAM) season. However, rainfall increase is likely during the southwest monsoon (JJA) season until the transition (SON) season in most areas of Luzon and Visayas, and also, during the northeast monsoon (DJF) season, particularly, in provinces/areas characterized as Type II climate in 2020 and 2050. There is however, generally decreasing trend in rainfall in Mindanao, especially by 2050.

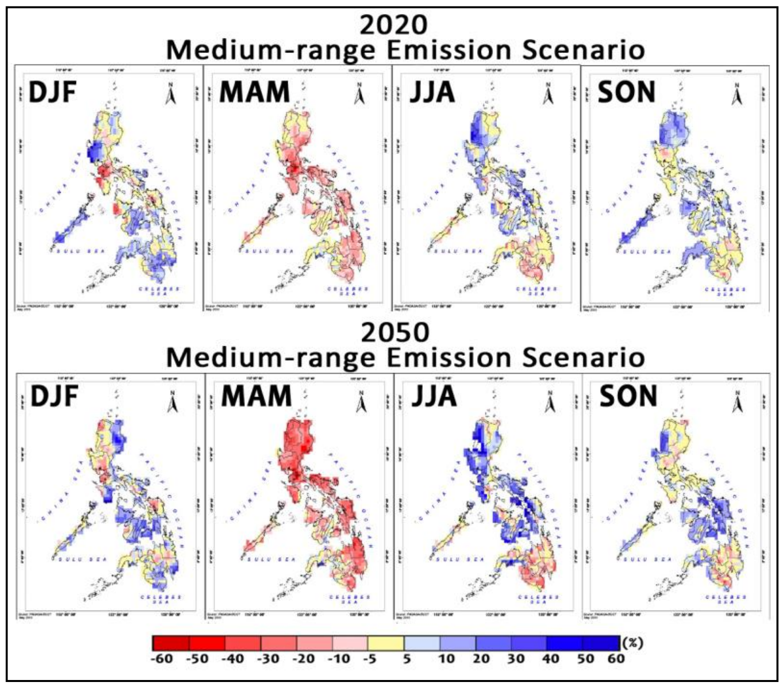
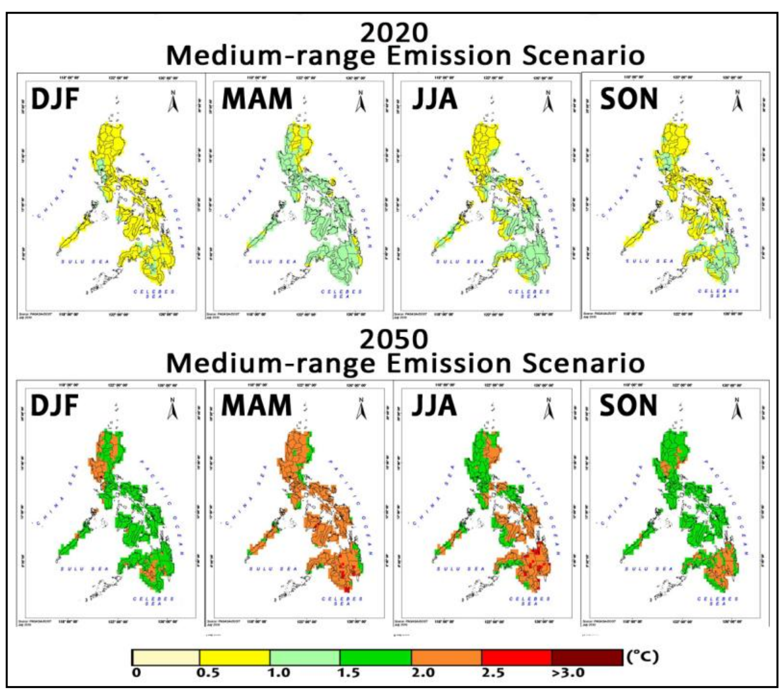


Fig.18: Maps showing the projected rainfall change (increase/decrease) in % in 2020 and 2050 in the Philippines.

There are varied trends in the magnitude and direction of the rainfall changes, both in 2020 and 2050. What the projections clearly indicate are the likely increase in the performance of the southwest and the northeast monsoons in the provinces exposed to these climate controls when they prevail over the country. Moreover, the usually wet seasons become wetter with the



usually dry seasons becoming also drier; and these could lead to more occurrences of floods and dry spells/droughts, respectively.

3.3 Extreme temperature events: hot temperatures will continue to become more frequent in the future.

Fig.19 shows that the number of days with maximum temperature exceeding 35 °C (following value used by other countries in the Asia Pacific region in extreme events analysis) is increasing in 2020 and 2050.

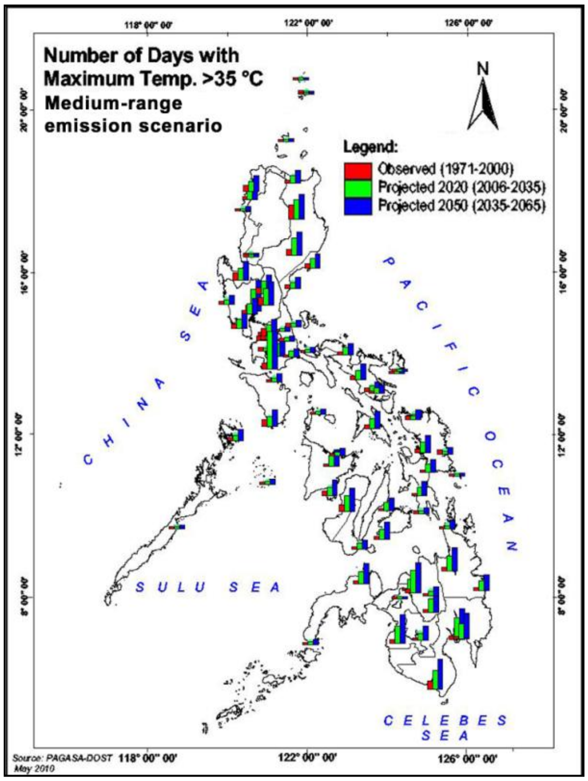


Fig.19: Number of days with maximum temperatures exceeding 35 °C (current or observed, in 2020 and in 2050) in the country under mid-range scenario.

3.4 Extreme Rainfall Events: heavy daily rainfall will continue to become more frequent, extreme rainfall is projected to increase in Luzon and Visayas only, but number of dry days is expected to increase in all parts of the country in 2020 and 2050.

Figures 20 and 21 show the projected increase in number of dry days (with dry day defined as that with rainfall less than 2.5mm) and the increase in number of days with extreme rainfall (defined as daily rainfall exceeding 300 mm) compared with the observed (baseline) values, respectively.

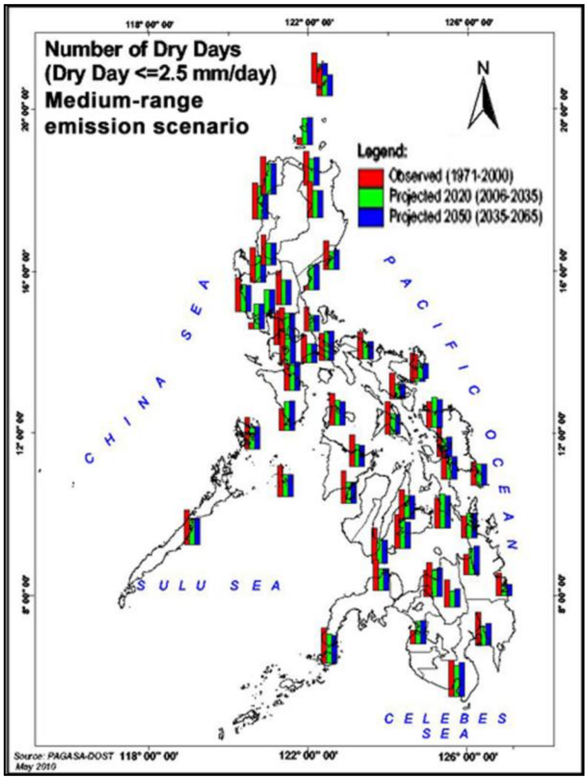


Fig.20: Current and projected number of dry days in the Philippines in 2020 and 2050 under mid-range scenario.

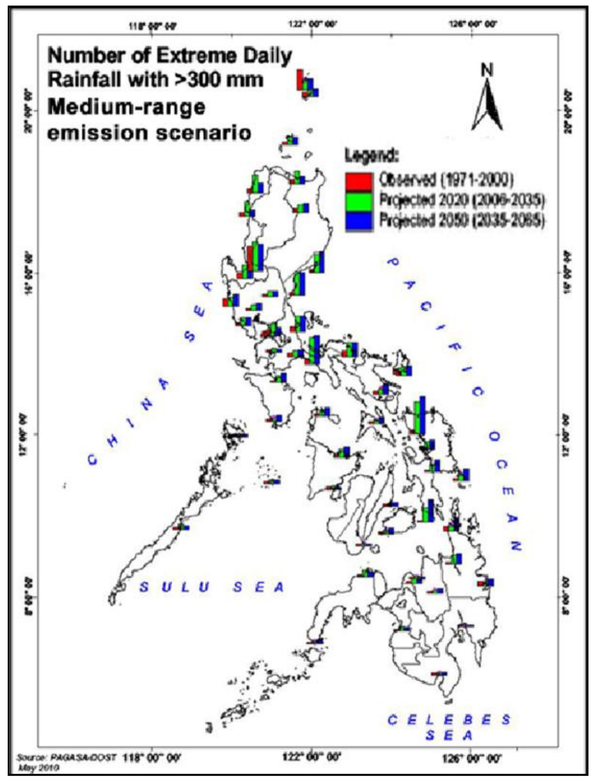


Fig.21: Current and projected extreme rainfall in the Philippines in 2020 and 2050 under mid-range scenario.

3.5 Projections for provinces

Projections for seasonal temperature and rainfall changes as well as projected increase in frequency of the extreme events (e.g., extreme temperature, dry days and extreme rainfall) as compared with observed average/actual values, in 2020 and 2050 under the mid-range scenario in each of the provinces per the 17 administrative regions (see Fig.22) are presented in this section.

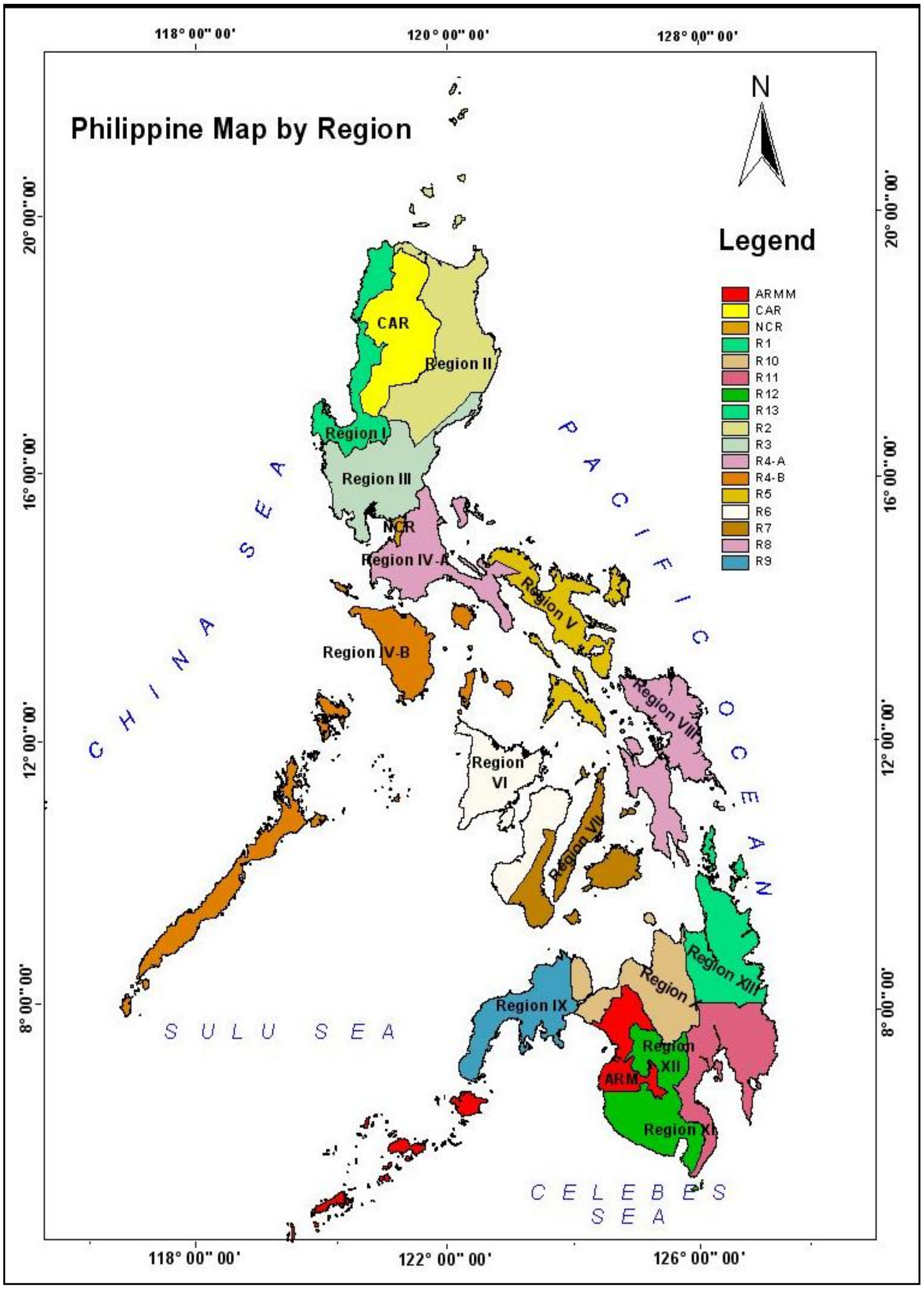


Fig.22: Map of the Philippines showing the 17 administrative regions

3.5.1 Climate Projections in 2020 and 2050 in Provinces in Region 1

The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 1 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Pangasinan, the projected values in 2020 are:

a. DJF mean temperature = (25.0 °C + 0.9 °C) = 25.9 °C;
b. DJF rainfall = {19.4mm+19.4(54.3%)mm} = (19.4+10.5)mm or 29.9mm;
c. number of days with Tmax > 35 °C in Dagupan City during the 2006-2035 period (centered at 2020) = 2,265;
d. number of dry days in Dagupan City during the 2006-2035 period (centered at 2020) = 6,443; and
e. number of days with rainfall > 300mm in Dagupan City during the 2006-2035 period (centered at 2020) =13.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 1

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	25.3	28.1	28.3	27.4	0.8	1.0	0.8	0.9	2.1	2.2	1.7	1.8
ILOCOS SUR	23.1	25.7	25.4	24.8	0.9	1.1	0.8	1.0	2.0	2.1	1.6	1.8
LA UNION	20.5	22.9	22.8	22.2	0.9	1.1	0.7	1.0	2.0	2.1	1.6	1.8
PANGASINAN	25.0	27.4	26.9	26.4	0.9	1.1	0.9	1.0	2.2	2.2	1.8	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 1

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	49.8	185.5	1106.4	595.4	4.4	-3.1	18.0	5.8	-18.8	-31.3	20.9	4.7
ILOCOS SUR	17.5	288.8	1575.4	672.9	-4.6	-2.0	36.3	23.0	-0.1	-27.6	58.1	33.3
LA UNION	14.7	395.6	1852.3	837.8	-0.4	4.5	43.1	30.0	-1.1	-24.6	72.5	39.0
PANGASINAN	19.4	298.0	1608.9	707.8	54.3	-6.0	6.1	5.9	1.1	-11.2	22.9	11.9

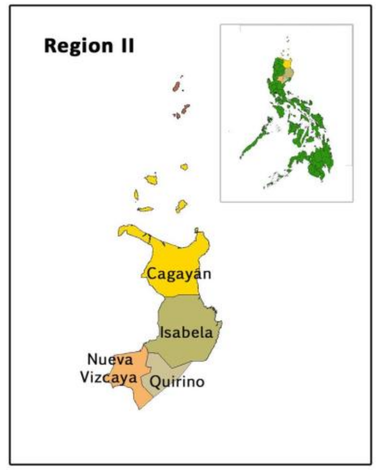
Table c: Total frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 1

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >300mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
ILOCOS NORTE	Laoag	801	1677	3157	9015	7391	7425	4	19	10
ILOCOS SUR	Vigan	110	130	627	8728	8105	7939	1	17	6
PANGASINAN	Dagupan	1280	2265	3728	8303	6443	6419	2	13	20

Note:

- For northern La Union, use values of Vigan.
- For southern La Union, use values of Dagupan
- OBS – Observed Baseline

3.5.2 Climate Projections in 2020 and 2050 in Provinces in Region 2



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 2 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Cagayan, the projected values in 2020 are:

a. DJF mean temperature in 2020 = (24.5 °C+0.8 °C) = 25.3 °C;
b. DJF rainfall in 2020 = {284.4mm+284.4(6.9%)mm} = (284.4+19.6)mm or 304mm;
c. number of days with Tmax > 35 °C in Aparri during the 2006-2035 (centered at 2020) = 1,276;
d. number of dry days in Aparri during the 2006-2035 period (centered at 2020) = 6,498; and
e. number of days with rainfall > 300mm in Aparri during the 2006-2035 period (centered at 2020) = 16.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

PROVINCES	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 2												
CAGAYAN	24.5	28.1	28.9	27.1	0.8	1.0	0.9	0.8	2.0	2.2	2.0	1.8
ISABELA	24.1	27.9	28.7	26.8	0.8	0.9	0.9	0.8	2.0	2.1	2.1	1.9
NUEVA VIZCAYA	22.3	25.1	25.4	24.4	0.9	1.0	0.9	0.9	2.0	2.1	1.9	1.9
BATANES	23.0	26.7	28.8	26.9	0.7	0.6	0.6	0.7	1.8	1.6	1.4	1.5
QUIRINO	23.7	26.8	27.6	26.2	0.9	1.0	1.0	0.9	2.0	2.2	2.0	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

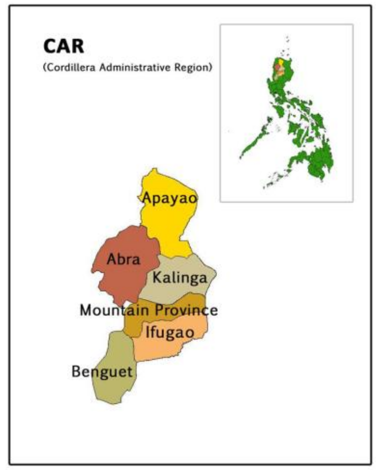
PROVINCES	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 2												
CAGAYAN	284.4	207.7	538.4	832.1	6.9	-3.6	2.9	16.3	14.6	-23.3	0.9	-1.0
ISABELA	412.2	325.0	530.8	867.0	3.9	-8.6	5.1	13.5	25.1	-29.2	8.7	1.7
NUEVA VIZCAYA	180.9	416.8	1149.8	880.5	-3.5	-8.6	20.1	9.8	-7.8	-23.6	36.1	-0.5
BATANES	531.1	354.5	928.7	1057.8	-2.1	-7.8	6.4	-14.4	-4.9	-4.4	10.2	-7.4
QUIRINO	419.0	465.9	776.4	957.9	-5.7	-18.2	9.7	6.1	-0.9	-33.9	12.9	-5.8

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 2

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
CAGAYAN	Aparri	273	1276	2403	8156	6498	6770	16	33	24
	Tuguegarao	2769	3930	5119	8573	6513	6580	6	25	22
BATANES	Basco	51	1	24	7038	5112	5315	17	13	20

Note:
- For northern Cagayan, use values of Aparri.
- For southern Cagayan, use values of Tuguegarao.
- For Isabela, use values of Tuguegarao.
- For Nueva Vizcaya, use values of Tuguegarao.
- For Quirino, use values of Baler (page 32).
- OBS- Observed Baseline

3.5.3 Climate Projections in 2020 and 2050 in Provinces in CAR (Cordillera Administrative Region)



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in CAR are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Benguet, the projected values in 2020 are:

a. DJF mean temperature in 2020 = (19.4 C+1.0 C) = 20.4 °C;
b. DJF rainfall = {47.7mm+47.7(8.0%)mm} = (47.7+3.8)mm or 51.5mm;
c. no. of days with Tmax > 35 C in Baguio City during the 2006-2035 period (centered at 2020) = 0;
d. no. of dry days in Baguio City during the 2006-2035 period(centered at 2020) = 5,320; and
e. no. of days with rainfall > 300mm in Baguio City during the 2006-2035 period (centered at 2020) = 39.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in CAR

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
CAR												
ABRA	24.5	27.4	27.2	26.4	0.8	1.0	0.8	0.9	2.0	2.1	1.6	1.9
APAYAO	24.8	28.0	28.4	27.1	0.8	0.9	0.9	0.8	1.9	2.1	1.9	1.8
BENGUET	19.4	21.9	22.0	21.2	0.9	1.0	0.8	1.0	2.0	2.1	1.7	1.9
IFUGAO	22.2	25.6	25.8	24.5	0.9	0.9	0.9	0.9	1.9	2.1	2.0	1.9
KALINGA	23.8	27.5	27.7	26.1	0.8	0.9	0.9	0.8	1.9	2.1	2.0	1.9
MOUNTAIN PROVINCE	22.7	26.0	26.1	24.9	0.9	0.9	0.9	0.9	1.9	2.1	1.9	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in CAR

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
CAR												
ABRA	43.5	220.6	1218.9	634.4	5.0	-1.8	22.3	14.0	-2.1	-28.1	35.0	15.9
APAYAO	144.6	184.0	822.7	720.1	2.6	0.4	5.8	16.6	3.0	-23.7	1.1	-0.3
BENGUET	47.7	422.3	1734.9	931.8	8.0	0.2	31.6	21.7	-6.0	-26.7	63.1	21.8
IFUGAO	102.6	321.0	1071.1	724.9	-6.0	-9.6	14.4	8.9	-1.3	-24.2	17.6	-2.9
KALINGA	92.3	228.0	892.3	691.9	1.0	-9.1	4.5	14.8	4.2	-21.0	3.9	1.1
MOUNTAIN PROVINCE	74.8	286.8	1121.1	699.2	-2.7	-7.7	16.4	14.9	1.1	-27.4	26.6	8.5

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in CAR

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >300mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
BENGUET	Baguio City	0	0	0	7248	5320	5379	29	39	35

Note:

- For Mountain Province and Ifugao, use values of Baguio City.
- For Abra, use values of Vigan (page 29).
- For Apayao, use values of Tuguegarao City (page 30).
- For Kalinga, use values of Tuguegarao City (page 30).
- OBS-Observed Baseline

3.5.4 Climate Projections in 2020 and 2050 in Provinces in Region 3

The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 3 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Nueva Ecija, the projected values in 2020 are:

a. DJF mean temperature = (25.3 °C+0.9 °C) = 26.2 °C;
b. DJF rainfall = {155.2mm+155.2(7.5%)mm} = (155.2+11.6)mm or 166.8mm;
c. number of days with Tmax > 35 °C in Cabanatuan during the 2006-2035 period (centered at 2020) = 3,271;
d. number of dry days in Cabanatuan during the 2006-2035 period (centered at 2020) = 6,117; and
e. number of days with rainfall > 300mm in Cabanatuan during the 2006-2035 period (centered at 2020) = 2.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 3												
AURORA	24.5	27.1	27.9	26.7	0.9	0.9	1.0	1.0	1.9	2.0	2.0	2.0
BATAAN	26.4	28.7	27.6	27.3	1.0	1.1	0.8	1.0	2.0	2.1	1.7	1.9
BULACAN	25.6	27.9	27.1	26.7	0.9	1.1	0.9	1.0	1.9	2.1	1.7	1.9
NUEVA ECIJA	25.3	27.7	27.5	26.8	0.9	1.1	0.9	1.0	2.0	2.1	1.8	2.0
PAMPANGA	26.0	28.3	27.5	27.1	1.0	1.1	0.9	1.0	2.1	2.2	1.8	2.0
TARLAC	26.1	28.3	27.8	27.3	1.1	1.1	1.0	1.1	2.2	2.2	1.9	2.1
ZAMBALES	26.3	28.3	27.4	27.2	1.0	1.1	0.9	1.0	2.1	2.1	1.7	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 3												
AURORA	615.7	546.4	768.7	1151.1	-0.3	-17.1	6.7	5.8	8.7	-29.2	7.4	-5.7
BATAAN	71.7	368.7	1326.2	872.6	2.7	-5.2	9.4	-0.4	-8.2	-8.1	29.1	1.5
BULACAN	212.4	288.9	1041.4	842.1	4.2	-23.0	12.8	-2.9	-13.2	-36.4	23.6	-3.3
NUEVA ECIJA	155.2	316.5	995.0	745.0	7.5	-13.8	10.1	1.6	-7.4	-25.7	22.7	-2.4
PAMPANGA	120.8	320.6	1030.4	785.2	16.3	-18.8	4.4	-5.1	-15.4	-26.4	13.9	-7.2
TARLAC	43.4	265.4	1193.5	644.3	26.0	-13.7	-1.6	-9.6	-6.7	-18.2	8.8	-5.5
ZAMBALES	40.9	368.0	1793.9	872.0	34.2	-4.5	13.3	-1.6	-2.2	-21.6	31.4	5.6

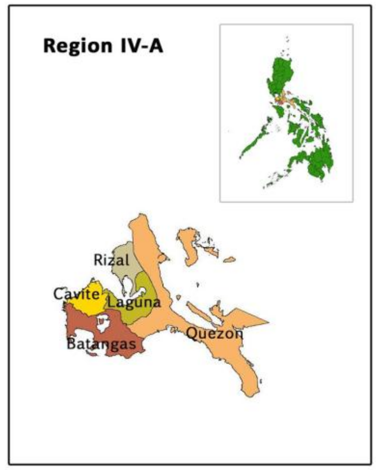
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 3

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
AURORA	Baler	397	819	2008	1295	6176	6161	12	43	43
NUEVA ECIJA	Cabanatuan	1293	3271	4796	8113	6117	6202	9	13	17
PAMPANGA	Clark	355	1855	3108	889	5701	5754	8	12	12
ZAMBALES	Iba	259	573	1573	8034	6500	6325	4	12	13

Note:

- For Tarlac, use values of Clark.
- For Bulacan, use values of Science Garden (page 35).
- OBS-Observed Baseline

3.5.5 Climate Projections in 2020 and 2050 in Provinces in Region 4-A



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 4-A are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Quezon, the projected values in 2020 are:

a. DJF mean temperature = (25.1 °C+0.9 °C) = 26.0 °C;
b. DJF rainfall = {827.7mm+827.7(-6.5%)mm} = (827.7-53.8)mm or 763.9mm;
c. number of days with Tmax > 35 °C in Casiguran during the 2006-2035 period (centered in 2020) = 1,720;
d. number of dry days in Casiguran during the 2006-2035 period (centered at 2020) = 4,520; and
e. number of days with rainfall > 300mm in Casiguran during the 2006-2035 period (centered at 2020) = 20.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-A

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 4-A												
BATANGAS	24.2	26.5	25.9	25.6	1.0	1.2	0.9	1.0	1.9	2.2	1.8	1.9
CAVITE	25.7	28.2	27.3	26.9	1.0	1.2	0.9	1.0	2.0	2.2	1.8	1.9
LAGUNA	25.0	27.5	27.5	26.7	0.9	1.1	1.0	0.9	1.8	2.1	1.9	1.9
QUEZON	25.1	27.2	27.6	26.7	0.9	1.1	1.0	0.9	1.8	2.1	2.0	1.8
RIZAL	25.4	27.9	27.6	26.8	0.9	1.1	0.9	1.0	1.9	2.1	1.8	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-A

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 4-A												
BATANGAS	231.0	280.4	856.5	746.4	-29.9	-24.1	9.1	0.5	-11.1	-23.1	17.2	6.3
CAVITE	124.9	242.8	985.7	579.0	-26.1	-28.2	13.1	0.4	-19.1	-30.5	24.2	5.9
LAGUNA	629.2	386.8	845.0	1066.5	-20.2	-31.5	2.9	2.9	0.1	-34.8	6.8	0.4
QUEZON	827.7	382.7	670.0	1229.3	-6.5	-18.6	2.9	5.2	6.6	-20.6	6.5	0.9
RIZAL	262.4	241.5	1001.3	821.8	-13.1	-30.7	12.4	-0.9	-11.5	-39.8	24.8	-0.8

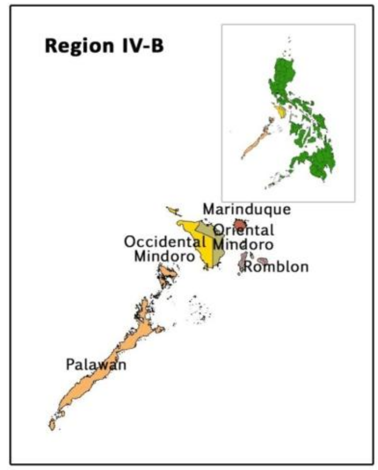
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-A

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
BATANGAS	Ambulong	928	8010	8016	8226	6081	6049	6	14	9
CAVITE	Sangley	630	1697	2733	7352	6635	6565	6	9	9
QUEZON	Alabat	53	132	733	6629	7025	7042	20	58	70
	Tayabas	22	791	1434	6771	4717	4668	17	9	12
	Casiguran	575	1720	2768	6893	4520	4887	23	54	57
	Infanta	350	378	1112	5903	4006	4015	22	39	34

Note:

- For northern portion of Quezon, use values of Casiguran.
- For middle part of Quezon, use values of Infanta.
- For southern portion of Quezon, use Tayabas.
- For Laguna, use values of Ambulong.
- OBS-Observed Baseline

3.5.6 Climate Projections in 2020 and 2050 in Provinces in Region 4-B



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 4-B are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Oriental Mindoro, the projected values in 2020 are:

a. DJF mean temperature = (26.4 °C+0.8 °C) = 27.2 °C;
b. DJF rainfall = {260.3mm+260.3(-3.2%)mm} = (260.3-8.3)mm or 252.0mm;
c. number of days with Tmax > 35 °C in Calapan during the 2006-2035 period (centered in 2020) = 440;
d. number of dry days in Calapan during the 2006-2035 period (centered at 2020) = 7,057; and
e. number of days with rainfall > 300mm in Calapan during the 2006-2035 period (centered at 2020) = 4.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-B

PROVINCES	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 4-B												
OCCIDENTAL MINDORO	26.5	28.3	27.3	27.1	0.9	1.1	0.9	1.0	1.9	2.1	1.8	1.9
ORIENTAL MINDORO	26.4	28.3	27.6	27.3	0.8	1.0	1.1	0.9	1.8	2.0	2.2	1.9
ROMBLON	26.3	28.5	28.1	27.7	0.8	1.1	0.9	0.8	1.8	2.2	1.9	1.7
PALAWAN	26.9	28.1	27.3	27.4	0.9	1.1	1.0	0.9	1.8	2.1	2.0	1.8

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-B

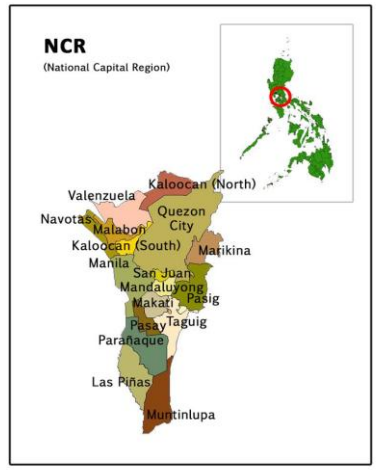
PROVINCES	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 4-B												
OCCIDENTAL MINDORO	159.5	265.9	1091.2	762.6	-14.3	-15.6	13.6	3.2	15.8	-23.8	26.7	-2.4
ORIENTAL MINDORO	260.3	269.3	894.3	791.2	-3.2	-15.1	0.5	6.2	21.6	-11.5	5.3	2.9
ROMBLON	357.0	224.0	652.9	778.0	9.0	0.2	27.6	22.6	32.6	26.3	66.2	37.9
PALAWAN	101.8	189.3	781.7	640.6	15.7	-7.2	-2.6	19.6	7.3	-9.0	1.0	6.9

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-B

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
OCCIDENTAL MINDORO	San Jose	1075	1773	3410	5437	7010	7128	8	5	14
ORIENTAL MINDORO	Calapan	80	440	1469	7604	7057	6902	3	11	22
PALAWAN	Puerto Princesa	29	23	297	8348	6457	6455	2	7	7
	Coron	242	739	1988	7726	5542	5561	4	4	3
	Cuyo	59	195	791	7447	5382	5406	5	5	2
ROMBLON	Romblon	59	235	756	7628	6125	5663	4	11	20

Note:
- For main island of Palawan, use values of Puerto Princesa.
- For Marinduque, use values of Calapan.

3.5.7 Climate Projections in 2020 and 2050 in Provinces in NCR (National Capital Region)



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in NCR are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Metro Manila, the projected values in 2020 are:

a. DJF mean temperature = (26.1 °C+1.0 °C) = 27.1 °C;
b. DJF rainfall = {107.5mm+107.5(-12.8%)mm} = (107.5-13.8)mm or 93.7mm;
c. number of days with Tmax > 35 °C in Quezon City during the 2006-2035 period (centered at 2020) = 1,984;
d. number of dry days in Quezon City during the 2006-2035 period (centered at 2020) = 6,302; and
e. number of days with rainfall > 300mm in Quezon City during the 2006-2035 period (centered at 2020) = 8.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in NCR

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
NCR												
METRO MANILA	26.1	28.8	28.0	27.4	1.0	1.1	0.9	1.0	2.0	2.1	1.8	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in NCR

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
NCR												
METRO MANILA	107.5	198.5	1170.2	758.7	-12.8	-33.3	8.5	0.0	-17.3	-38.5	21.3	3.7

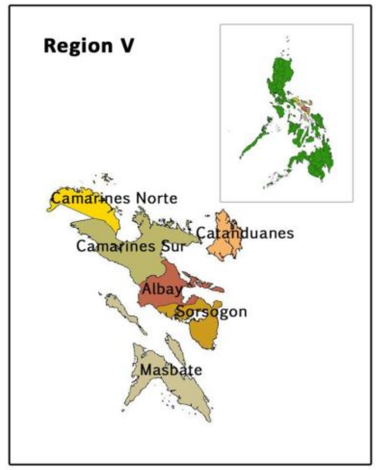
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in NCR

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
METRO MANILA	Port Area	299	1176	2118	7380	6445	6382	12	12	13
	Science Garden	1095	1984	3126	7476	6302	6220	9	13	17

Note:

- For Kalookan North, Quezon City, Marikina, Pasig, Taguig, San Juan Mandaluyong, use values of Science Garden.
- For Navotas, Kalookan South, Malabon and Valenzuela, use values of Port Area.
- OBS-Observed Baseline

3.5.8 Climate Projections in 2020 and 2050 in Provinces in Region 5



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 5 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Albay, the projected values in 2020 are:

a. DJF mean temperature = (25.6 °C+0.9 °C) = 26.5 °C;
b. DJF rainfall = {739.8mm+ 739.8(+0.5%)mm} = (739.8 +3.7)mm or 743.5mm;
c. number of days with Tmax > 35 °C in Legaspi City during the 2006-2035 period (centered at 2020) = 683;
d. number of dry days in Legaspi City during the 2006-2035 period (centered at 2020) = 3,698; and
e. number of days with rainfall > 300mm in Legaspi City during the 2006-2035 period (centered at 2020) = 4.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 5

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 5												
ALBAY	25.6	27.2	27.8	27.1	0.9	1.2	0.9	0.9	1.8	2.2	1.9	1.8
CAMARINES NORTE	25.7	27.6	28.3	27.3	0.9	1.1	1.0	0.9	1.8	2.2	2.1	1.8
CAMARINES SUR	25.6	27.5	28.1	27.1	0.9	1.1	1.0	0.9	1.8	2.2	2.0	1.8
CATANDUANES	24.7	26.3	27.2	26.4	0.8	1.0	1.0	0.8	1.6	2.0	1.9	1.7
MASBATE	26.6	28.4	28.6	28.0	0.9	1.2	1.0	0.9	1.8	2.4	2.1	1.8
SORSOGON	25.9	27.4	27.9	27.3	0.8	1.1	0.9	0.9	1.6	2.1	1.8	1.5

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 5

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 5												
ALBAY	739.8	386.9	705.8	941.3	0.5	-11.1	14.3	6.4	5.7	-18.2	25.3	10.3
CAMARINES NORTE	1029.6	398.5	565.6	1285.7	0.0	-17.8	5.2	7.8	5.6	-31.0	8.9	1.5
CAMARINES SUR	666.8	347.4	639.6	1029.4	2.0	-14.9	9.5	5.8	4.1	-25.2	16.5	1.9
CATANDUANES	1075.4	512.7	646.3	1199.5	13.6	-7.0	16.3	8.7	13.5	-18.7	24.4	8.2
MASBATE	510.2	250.7	569.4	739.3	-1.1	-6.5	23.4	12.5	11.1	-7.4	42.9	27.9
SORSOGON	958.1	427.9	660.4	973.6	5.1	-6.8	14.6	10.8	7.4	-11.4	27.3	16.2

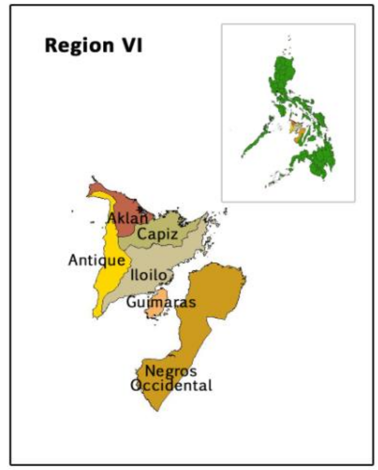
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 5

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >300mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
ALBAY	Legaspi	27	683	1393	6219	3698	3811	1	4	11
CAMARINES NORTE	Daet	118	1141	1981	6675	4288	4412	1	18	16
CATANDUANES	Virac Synop	4	206	668	6958	4292	4412	3	4	5
MASBATE	Masbate	392	1724	3459	7735	5018	4825	1	2	5

Note:

- For northern portion of Camarines Norte, use values of Daet.
- For southern portion of Camarines Sur, use values of Legaspi.
- For northern portion of Sorsogon, use values of Legaspi.
- For south western portion of Sorsogon, use values of Masbate.
- For south eastern portion of Sorsogon, use values of Catarman.

3.5.9 Climate Projections in 2020 and 2050 in Provinces in Region 6



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 6 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Iloilo province, the projected values in 2020 are:

a. DJF mean temperature = (26.4 °C+1.0 °C) = 27.4 °C;
b. DJF rainfall = {324.8mm+(324.8+1.2%)mm} = (324.8 +3.9) or 325.7mm;
c. number of days with Tmax > 35 °C in Iloilo City during the 2006-2035 period (centered at 2020) = 1,431;
d. number of dry days in Iloilo City during the 2006-2035 period (centered at 2020) = 5,227; and
e. number of days with rainfall > 300mm in Iloilo City during the 2006-2035 period (centered at 2020) = 3.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 6

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	26.1	27.9	27.8	27.4	1.0	1.2	1.0	0.9	1.9	2.4	2.1	1.8
ANTIQUE	26.6	28.4	27.9	27.7	1.0	1.2	0.9	0.9	1.9	2.2	1.9	1.8
CAPIZ	25.9	27.7	27.8	27.3	0.9	1.2	1.1	1.0	1.9	2.4	2.2	1.9
ILOILO	26.4	28.2	27.9	27.6	1.0	1.3	1.1	1.0	1.9	2.4	2.1	1.9
NEGROS OCCIDENTAL	26.7	28.4	27.8	27.6	0.9	1.2	1.0	1.0	1.9	2.3	2.0	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 6

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	431.2	322.7	862.5	883.7	3.9	-8.8	-4.0	16.9	14.9	-13.4	-5.5	11.1
ANTIQUE	297.9	288.0	995.3	841.4	-17.2	-12.8	9.8	14.6	17.0	-12.6	21.7	11.9
CAPIZ	469.7	342.0	814.2	889.1	4.6	-5.8	-3.4	18.2	17.5	-12.9	-5.3	12.9
ILOILO	324.8	290.6	932.8	828.3	1.2	-8.6	-0.6	11.5	20.4	-13.3	3.8	3.9
NEGROS OCCIDENTAL	234.9	283.0	899.6	784.0	7.1	-3.7	6.0	5.7	7.3	-9.3	11.8	14.3

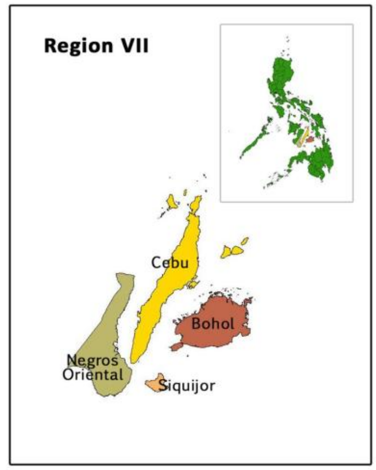
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 6

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
CAPIZ	Roxas	52	430	1327	7792	5574	5340	3	11	14
ILOILO	Iloilo	460	1431	3076	7839	5227	5226	4	5	4

Note:

- For Aklan, use values of Roxas City.
- For Antique, use values of Iloilo City.
- For Negros Occidental, use values of Iloilo City.
- OBS-Observed Baseline

3.5.10 Climate Projections in 2020 and 2050 in Provinces in Region 7



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 7 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Bohol province, the projected values are:

a. DJF mean temperature = (26.6 °C +0.9 °C) = 27.5 °C;
b. DJF rainfall = {376.1mm+376.1(9.8%)mm} = (376.1+36.9m) or 413mm;
c. number of days with Tmax > 35 °C in Tagbilaran City during the 2006-2035 period (centered at 2020) = 1,710;
d. number of dry days in Tagbilaran City during the 2006-2035 period (centered at 2020)= 6,836; and
e. number of days with rainfall > 300mm in Tagbilaran City during the 2006-2035 period (centered at 2020) = 1.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 7

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 7												
BOHOL	26.6	28.0	28.2	27.8	0.9	1.2	1.2	1.0	1.8	2.3	2.3	1.9
CEBU	26.8	28.4	28.2	27.9	0.9	1.2	1.1	1.0	1.9	2.4	2.1	1.9
NEGROS ORIENTAL	27.0	28.4	28.0	27.8	0.9	1.2	1.0	1.0	1.9	2.3	2.0	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 7

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 7												
BOHOL	376.1	209.6	412.9	514.5	9.8	-7.1	4.5	6.8	21.2	-11.9	18.9	22.6
CEBU	324.0	228.3	595.1	607.4	17.7	0.8	7.7	7.7	19.6	0.5	18.9	17.8
NEGROS ORIENTAL	225.8	226.0	639.5	636.9	15.0	-4.9	9.3	4.7	17.4	-6.8	20.7	10.5

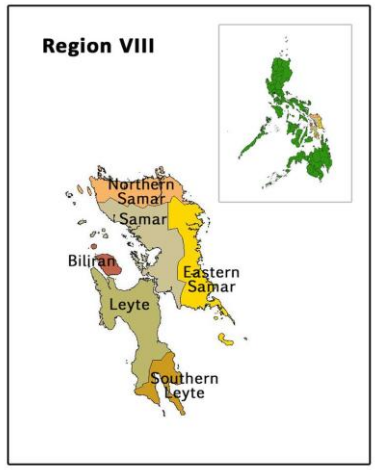
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 7

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >100mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
BOHOL	Tagbilaran	260	1710	3413	8176	6836	6473	15	21	23
CEBU	Mactan	25	1488	2463	7112	5720	5693	12	4	17
NEGROS ORIENTAL	Dumaguete	66	826	1499	8451	6032	5642	5	7	6

Note:

- For Siquijor, use values of Dumaguete.
- OBS-Observed Baseline

3.5.11 Climate Projections in 2020 and 2050 in Provinces in Region 8



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 8 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Leyte province, the projected values in 2020 are:

a. DJF mean temperature = (26.4 °C + 0.9 °C)=27.3 °C;
b. DJF rainfall = {689.5mm+689.5(3.0%)mm} = (689.5+20.7)mm or 710.2mm;
c. number of days with Tmax > 35 °C in Tacloban City during the 2006-2035 period (centered at 2020) = 1,398;
d. number of dry days in Tacloban City during the 2006-2035 period (centered at 2020) = 5,199; and
e. number of days with rainfall > 300mm in Tacloban City during the 2006-2035 period (centered at 2020) = 7.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 8

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 8												
EASTERN SAMAR	26.1	27.7	28.3	27.7	0.8	1.1	1.1	1.0	1.7	2.1	2.2	1.8
LEYTE	26.4	27.8	28.0	27.7	0.9	1.2	1.1	1.0	1.8	2.3	2.2	1.9
NORTHERN SAMAR	26.0	27.5	28.3	27.5	0.9	1.2	1.0	0.9	1.8	2.4	2.0	1.7
SAMAR	26.3	27.9	28.4	27.8	0.9	1.2	1.0	1.0	1.8	2.4	2.1	1.8
SOUTHERN LEYTE	26.4	27.7	27.8	27.5	0.9	1.1	1.2	1.0	1.7	2.1	2.3	1.9

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 8

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 8												
EASTERN SAMAR	987.0	464.1	559.8	871.4	3.1	-11.3	2.2	8.1	1.7	-26.8	2.2	15.8
LEYTE	689.5	342.0	568.7	725.5	3.0	-8.9	9.5	7.4	9.4	-18.9	19.6	19.5
NORTHERN SAMAR	1128.9	462.2	566.8	981.4	0.8	-9.6	15.1	6.5	-10.7	-20.2	22.1	18.7
SAMAR	889.5	437.0	599.8	879.4	-8.3	-16.0	11.7	5.0	-11.1	-23.0	20.8	21.1
SOUTHERN LEYTE	818.6	362.2	510.6	695.6	9.7	-5.0	5.7	7.2	17.1	-16.0	13.0	17.9

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 8

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
EASTERN SAMAR	Guiuan	67	20	186	5847	5342	5287	1	12	22
LEYTE	Tacloban	52	1398	2495	6874	5199	5475	1	10	15
NORTHERN SAMAR	Catarman	360	411	1627	6378	7288	6816	15	86	94
WESTERN SAMAR	Catbalogan	455	1908	3388	6900	4551	4896	4	11	21
SOUTHERN LEYTE	Maasin	130	195	764	7201	8144	7786	4	49	51

Note:

- OBS-Observed Baseline

3.5.12 Climate Projections in 2020 and 2050 in Provinces in Region 9

The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 9 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Zamboanga del Sur province, the projected values in 2020 are:

a. DJF mean temperature = (26.8 °C+0.9 °C) = 27.7 °C;
b. DJF rainfall = {294.5mm+294.5(11.2%)mm} = (294.5+33.0)mm or 327.0mm;
c. number of days with Tmax > 35 C in Zamboanga City during the 2006-2035 period (centered at 2020) = 114;
d. number of dry days in Zamboanga City during the 2006-2035 period (centered at 2020) = 7,058; and
e. number of days with rainfall > 300mm in Zamboanga City during the 2006-2035 period (centered at 2020) = 1.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 9

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 9												
ZAMBOANGA DEL NORTE	27.0	27.9	27.6	27.5	1.0	1.1	1.1	1.0	2.0	2.1	2.2	2.0
ZAMBOANGA DEL SUR	26.8	27.6	27.3	27.2	0.9	1.1	1.0	1.0	1.9	2.1	2.0	1.9
ZAMBOANGA SIBUGAY	27.1	27.9	27.5	27.5	1.0	1.0	1.0	1.0	2.0	2.0	1.9	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 9

	OBSERVED BASELINE (1971-2000)mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 9												
ZAMBOANGA DEL NORTE	324.5	279.7	599.1	718.1	11.0	3.2	-3.2	13.8	2.6	1.7	-0.7	5.4
ZAMBOANGA DEL SUR	294.5	298.7	593.8	663.2	11.2	2.2	-0.4	13.8	3.6	0.0	9.9	7.1
ZAMBOANGA SIBUGAY	284.1	290.5	597.2	674.1	9.9	6.6	6.5	14.8	4.8	10.3	22.0	8.9

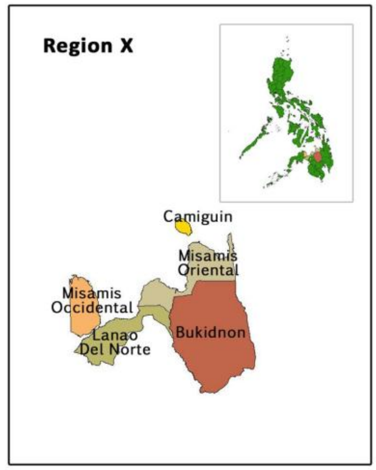
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 9

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >150mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
ZAMBOANGA DEL NORTE	Dipolog	217	2155	4004	7481	5384	5470	10	13	9
ZAMBOANGA DEL SUR	Zamboanga	54	114	714	8531	7058	6781	1	8	9

Note:

- Zamboanga Sibugay, use values of Zamboanga City.
- OBS-Observed Baseline

3.5.13 Climate Projections in 2020 and 2050 in Provinces in Region 10



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 10 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Bukidnon province, the projected values in 2020 are:

a. DJF mean temperature = (25.1 °C+1.0 °C)= 26.1 °C;
b. DJF rainfall = {329.7mm+329.7(2.9%)mm} = (329.7+9.6)mm or 339.3mm;
c. number of days with Tmax > 35 °C in Malaybalay during the 2006-2035 period (centered at 2020) = 477;
d. number of dry days in Malaybalay during the 2006-2035 period (centered at 2020) = 3,977; and
e. number of days with rainfall > 300mm in Malaybalay during the 2006-2035 period (centered at 2020) = 1.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 10

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 10												
BUKIDNON	25.1	26.5	25.8	25.7	1.0	1.2	1.2	1.0	1.9	2.3	2.4	2.1
LANAO DEL NORTE	24.4	25.5	25.4	25.2	1.0	1.1	1.0	1.0	1.9	2.2	2.1	1.9
MISAMIS OCCIDENTAL	25.6	26.7	26.6	26.4	1.0	1.1	1.1	1.0	1.9	2.2	2.2	1.9
MISAMIS ORIENTAL	25.4	26.8	26.9	26.5	1.0	1.2	1.2	1.0	1.9	2.3	2.4	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 10

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 10												
BUKIDNON	329.7	335.6	653.8	559.5	2.9	-10.3	-4.4	-0.3	-5.1	-13.0	-9.7	-5.8
LANAO DEL NORTE	337.5	350.3	662.5	621.1	9.6	-0.6	-2.2	6.9	2.5	-1.9	1.4	7.1
MISAMIS OCCIDENTAL	392.1	323.4	633.1	728.3	9.1	1.4	-6.1	6.1	5.2	0.3	-5.1	4.6
MISAMIS ORIENTAL	442.5	296.0	615.7	581.1	4.6	-10.4	-3.7	2.9	1.8	-17.8	-5.2	-0.1

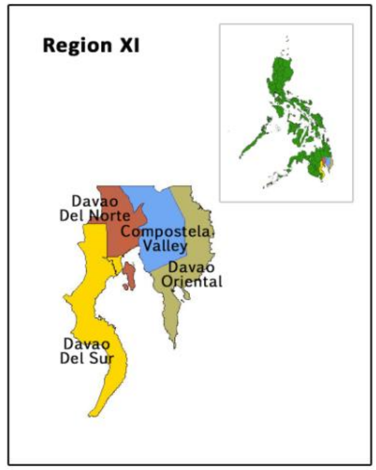
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 10

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >150mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
BUKIDNON	Malaybalay	26	477	1441	6537	3977	4461	4	9	9
LANAO DEL NORTE	Dipolog	217	2155	4004	7481	5384	5470	3	6	1
MISAMIS ORIENTAL	Cagayan De Oro	383	4539	6180	8251	6413	7060	10	13	9
	Lumbia	106	2012	3759	6495	6290	6580	3	6	1

Note:

- For western portion of Misamis Occidental, use values of Dipolog City.
- OBS-Observed Baseline

3.5.14 Climate Projections in 2020 and 2050 in Provinces in Region 11



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 11 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Davao del Sur province, the projected values in 2020 are:

a. DJF mean temperature = (26.9 °C+0.9 °C) = 27.8 °C;
b. DJF rainfall = {288.1mm+288.1(18.1%)mm} = (288.1+52.1)mm = 346.2mm;
c. number of days with Tmax > 35 °C in Davao City during the 2006-2035 period (centered at 2020) = 2,981;
d. number of dry days in Davao City during the 2006-2035 period (centered at 2020) = 4,789; and
e. number of days with rainfall > 300mm during the 2006-2035 period (centered at 2020) = 0.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 11

PROVINCES	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 11												
COMPOSTELA VALLEY	26.7	27.8	27.6	27.6	0.9	1.1	1.2	1.1	1.9	2.3	2.4	2.1
DAVAO DEL NORTE	26.7	27.8	27.4	27.4	0.9	1.1	1.2	1.1	1.9	2.3	2.5	2.1
DAVAO DEL SUR	26.9	27.8	26.9	27.1	0.9	1.1	1.1	1.0	1.9	2.2	2.3	2.0
DAVAO ORIENTAL	26.8	27.8	27.5	27.6	0.9	1.0	1.1	1.0	1.8	2.0	2.4	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 11

PROVINCES	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 11												
COMPOSTELA VALLEY	748.1	559.0	546.7	586.6	10.2	-11.3	-2.7	0.3	6.6	-21.9	-6.5	0.0
DAVAO DEL NORTE	637.0	496.5	535.6	556.2	9.2	-12.5	-3.6	-1.5	1.1	-22.2	-7.9	-2.2
DAVAO DEL SUR	288.1	347.1	494.1	442.3	18.1	-9.8	-7.8	-2.4	15.2	-12.0	-12.6	-4.5
DAVAO ORIENTAL	827.3	611.8	540.4	599.2	12.3	-5.7	-4.7	1.2	15.9	-16.1	-9.9	4.9

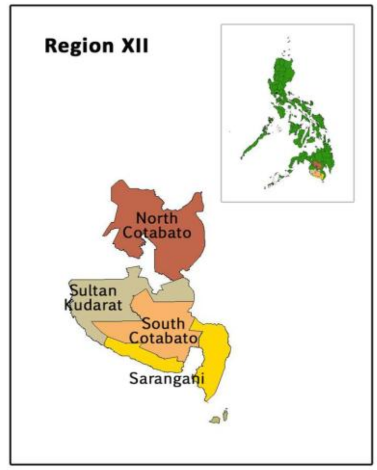
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 11

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >150mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
DAVAO DEL SUR	Davao	109	2981	5373	7930	4789	5368	2	3	4

Note:

- For Davao del Norte, Davao Oriental and Compostela valley, use values of Davao City.
- OBS-Observed Baseline

3.5.15 Climate Projections in 2020 and 2050 in Provinces in Region 12



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Region 12 are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in South Cotabato province, the projected values in 2020 are;

a. DJF mean temperature = (27.7 °C +1.0 °C) = 28.7 °C;
b. DJF rainfall = {183.3mm+183.3 (10.1%)mm} = (183.3+18.5)mm or 201.8mm;
c. number of days with Tmax > 35 °C in General Santos City during the 2006-2035 period (centered at 2020) = 3,748;
d. number of dry days in General Santos City during the 2006-2035 period (centered at 2020) = 7,526; and
e. number of days with rainfall > 300mm in General Santos City during the 2006-2035 period (centered at 2020) = 0.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Region 12

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 12												
NORTH COTABATO	26.8	27.9	27.0	27.1	1.0	1.3	1.2	1.1	2.1	2.5	2.4	2.1
SARANGANI	27.7	28.4	27.3	27.6	0.9	1.2	1.1	1.0	1.9	2.4	2.2	2.0
SOUTH COTABATO	27.7	28.5	27.4	27.7	1.0	1.2	1.1	1.1	2.0	2.3	2.2	2.1
SULTAN KUDARAT	27.8	28.6	27.6	27.8	1.0	1.2	1.1	1.0	2.0	2.2	2.2	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 12

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 12												
NORTH COTABATO	235.4	353.2	572.5	486.0	14.8	-5.9	-6.1	1.6	8.1	-4.5	-8.7	-4.2
SARANGANI	212.3	212.6	333.6	302.5	10.1	-12.1	-9.3	-1.7	15.6	-17.6	-10.4	-5.3
SOUTH COTABATO	183.3	234.1	402.8	351.7	10.1	-8.7	-12.1	-6.8	8.6	-10.8	-18.0	-14.4
SULTAN KUDARAT	189.3	311.0	513.1	448.7	6.1	-2.3	-9.2	2.9	7.5	-4.2	-13.6	1.3

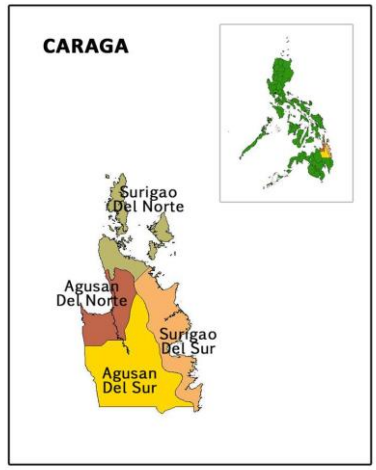
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Region 12

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >150mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
SOUTH COTABATO	General Santos	1397	3748	6430	8704	7526	8052	1	1	2

Note:

- For North Cotabato, use values of Cotabato City (page 45).
- For Sultan Kuldarat, use values of Cotabato City (page 45).
- For Sarangani, use values of General Santos City.
- OBS-Observed Baseline

3.5.16 Climate Projections in 2020 and 2050 in Provinces in CARAGA



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in Caraga are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Surigao del Norte province, the projected values in 2020 are:

a. DJF mean temperature = (26.3 °C+0.9 °C) = 27.2 °C;
b. DJF rainfall = {963.3mm+963.3 (4.0%)mm} = (963.3+38.5)mm or 1001.8mm;
c. number of days with Tmax > 35 °C in surigao City during the 2006-2035 period (centered at 2020) = 225;
d. number of dry days in Surigao City during the 2006-2035 period (centered at 2020) = 6,054; and
e. number of days with rainfall > 300mm in Surigao City during the 2006-2035 period (centered at 2020) = 2.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in Caraga

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
CARAGA												
AGUSAN DEL NORTE	26.2	27.6	27.8	27.4	1.0	1.2	1.3	1.1	1.9	2.3	2.5	2.2
AGUSAN DEL SUR	25.9	27.1	27.2	26.9	0.9	1.1	1.1	1.1	1.9	2.2	2.4	2.1
SURIGAO DEL NORTE	26.3	27.6	28.2	27.7	0.9	1.1	1.3	1.1	1.7	2.2	2.6	2.0
SURIGAO DEL SUR	26.4	27.4	27.9	27.4	0.9	1.0	1.1	1.1	1.7	2.0	2.3	2.0

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Caraga

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
CARAGA												
AGUSAN DEL NORTE	875.7	441.9	460.0	628.9	-0.8	-24.4	-7.9	5.0	13.8	-36.5	-8.3	0.6
AGUSAN DEL SUR	963.3	586.4	593.4	694.8	4.0	-13.1	0.0	-6.0	-2.9	-26.1	-3.4	-5.9
SURIGAO DEL NORTE	1412.0	639.6	448.0	837.3	2.1	-11.7	-3.3	4.2	3.2	-33.2	-8.7	9.6
SURIGAO DEL SUR	1394.0	746.9	534.6	842.5	5.8	-11.7	-2.2	-4.8	4.0	-29.1	-7.9	-3.7

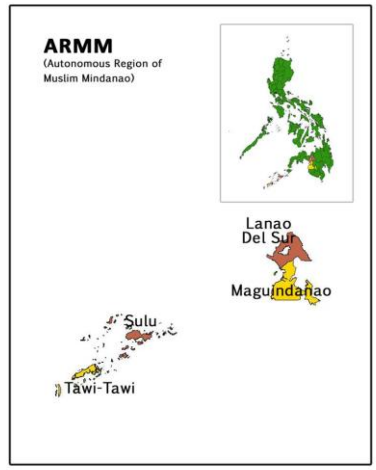
Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in Caraga

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >200mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
AGUSAN DEL NORTE	Butuan	324	2855	4767	4997	6300	6804	1	17	25
SURIGAO DEL NORTE	Surigao	86	225	1333	5286	6054	5975	9	22	38
SURIGAO DEL SUR	Hinatuan	157	1635	3024	5667	2715	3080	18	10	13

Note:

- For Agusan del Sur, use values of Butuan City.
- OBS-Observed Baseline

3.5.17 Climate Projections in 2020 and 2050 in Provinces in ARMM (Autonomous Region of Muslim Mindanao)



The projected seasonal temperature increase, seasonal rainfall change and frequency of extreme events in 2020 and 2050 under the medium-range emission scenario in the provinces in ARMM are presented in Table a, Table b and Table c, respectively.

To use the tables and arrive at values of seasonal mean temperature and seasonal rainfall in 2020 and 2050 in any of the provinces, the projections are added to the observed values (presented in each of the tables).

For example, in Maguindanao province, the projected values in 2020 are:

a. DJF mean temperature = (27.6 °C +1.0 °C) = 28.6 °C;
b. DJF rainfall = {225.3mm+225.3 (6.3%)mm} = (225.3+14.2)mm or 239.5mm;
c. number of days with Tmax > 35 °C in Cotabato City during the 2006-2035 period (centered at 2020) = 3,382;
d. number of dry days in Cotabato City during the 2006-2035 period (centered at 2020) = 5,471; and
e. number of days with rainfall > 300 days in Cotabato City during the 2006-2035 period (centered at 2020) = 3.

Table a: Seasonal temperature increases (in °C) in 2020 and 2050 under medium-range emission scenario in provinces in ARMM

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
ARMM												
LANAO DEL SUR	24.3	25.4	25.0	24.9	1.0	1.2	1.1	1.0	2.0	2.3	2.2	2.0
MAGUINDANAO	27.6	28.3	27.5	27.6	1.0	1.2	1.2	1.1	2.1	2.3	2.4	2.1

Table b: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in ARMM

	OBSERVED BASELINE (1971-2000) mm				CHANGE in 2020 (2006-2035)				CHANGE in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
ARMM												
LANAO DEL SUR	293.8	369.4	661.5	562.2	7.2	-6.3	-7.2	0.3	-1.1	-4.6	-7.4	-3.6
MAGUINDANAO	225.3	399.1	635.3	553.6	6.3	1.4	-7.4	3.5	5.3	-1.4	-12.6	-1.2

Table c: Frequency of extreme events in 2020 and 2050 under medium-range emission scenario in provinces in ARMM

Provinces	Stations	No. of Days w/ Tmax >35 °C			No. of Dry Days			No. of Days w/ Rainfall >150mm		
		OBS (1971-2000)	2020	2050	OBS	2020	2050	OBS	2020	2050
MAGUINDANAO	Cotabato	384	3382	5994	3516	5471	5788	2	10	5

Note:
- For Lanao del Sur, use values of Cotabato City.
- OBS-Observed Baseline

Chapter 4

What are the likely Impacts of Climate Change?

CHAPTER 4: WHAT ARE THE LIKELY IMPACTS OF CLIMATE CHANGE?

This Chapter provides an overview of:

- What if the emissions are less or greater;
- Likely impacts of climate change
  - water resources;
  - forestry;
  - agriculture;
  - coastal; and
  - health
- Conclusion

Climate change is one of the most fundamental challenges ever to confront humanity. Its adverse impacts are already being seen and may intensify exponentially over time if nothing is done to reduce further emissions of greenhouse gases. Decisively dealing NOW with climate change is key to ensuring sustainable development, poverty eradication and safeguarding economic growth. Scientific assessments indicate that the cost of inaction now will be more costly in the future. Thus, economic development needs to be shifted to a low-carbon emission path.

In 1992, the **United Nations Framework Convention on Climate Change (UNFCCC)** was adopted as the basis for a global response to the problem. The Philippines signed the UNFCCC on 12 June 1992 and ratified the international treaty on 2 August 1994. Presently, the Convention enjoys near-universal membership, with 194 Country Parties.

Recognizing that the climate system is a shared resource which is greatly affected by anthropogenic emissions of greenhouse gases, the UNFCCC has set out an overall framework for intergovernmental efforts to consider what can be done to reduce global warming and to cope with whatever temperature increases are inevitable. Its ultimate objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system.

Countries are actively discussing and negotiating ways to deal with the climate change problem within the UNFCCC using two central approaches. The first task is to address the root cause by reducing greenhouse gas emissions from human activity. The means to achieve this are very contentious, as it will require radical changes in the way many societies are organized, especially in respect to fossil fuel use, industry operations, land use, and development. Within the climate change arena, the reduction of greenhouse gas emissions is called "mitigation".

The second task in responding to climate change is to manage its impacts. Future impacts on the environment and society are now inevitable, owing to the amount of greenhouse gases already in the atmosphere from past decades of industrial and other human activities, and to the added amounts from continued emissions over the next few decades until such time as mitigation policies and actions become effective. We are therefore committed to changes in the climate. Taking steps to cope with the changed climate conditions both in terms of reducing adverse impacts and taking advantage of potential benefits is called “adaptation”.

4.1 What if the emissions are less or greater?

Responses of the local climate to the mid-range compared to the high- and low-range scenarios are as shown in Fig. 22 below. Although there are vast differences in the projections, the so-called temperature anomalies or difference in surface temperature increase begin to diverge only in the middle of the 21st century. As has already been stated, the climate in the next 30 to 40 years is greatly influenced by past greenhouse gas emissions. The long lifetimes of the greenhouse gases already in the atmosphere, with the exception of methane (with a lifetime of only 13 years), will mean that it will take at least 30 to 40 years for the atmosphere to stabilize even if mitigation measures are put in place, not withstanding that in the near future, there could be some off-setting between sulfate aerosols (cooling effect) and the greenhouse gas concentrations (warming effect).

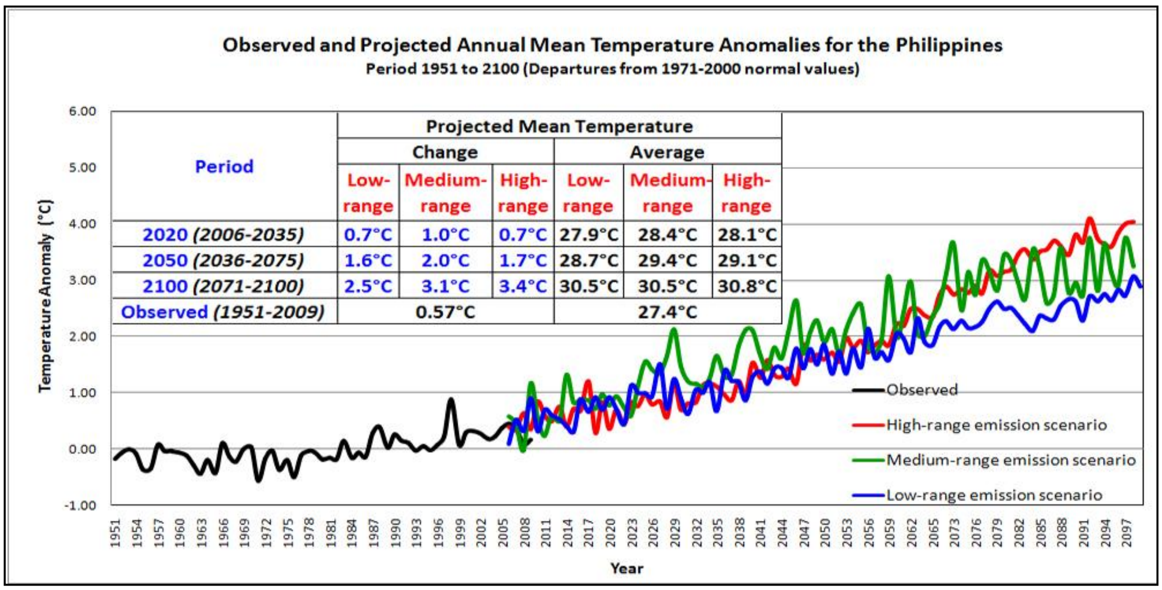


Fig.23: Response in local climate (temperature increases) to the high-, mid- and low-range emission scenarios and how these values will diverge in the future.

4.2 Likely impacts of climate change

A warmer world is certain to impact on systems and sectors; although, magnitude of impacts will depend on factors such as sensitivity, exposure and adaptive capacity to climate risks. In most cases, likely impacts will be adverse. However, there could be instances when likely impacts present opportunities for potential benefits as in the case of the so-called carbon fertilization effect in which increased carbon dioxide could lead to increased yield provided temperatures do not exceed threshold values for a given crop/cultivar.

4.2.1 Water Resources

In areas/regions where rainfall is projected to decrease, there will be water stress (both in quantity and quality), which in turn, will most likely cascade into more adverse impacts, particularly on forestry, agriculture and livelihood, health, and human settlement.

Large decreases in rainfall and longer drier periods will affect the amount of water in watersheds and dams which provide irrigation services to farmers, especially those in rain fed areas, thereby, limiting agricultural production. Likewise, energy production from dams could also be rendered insufficient in those areas where rainfall is projected to decrease, and thus, could largely affect the energy sufficiency program of the country. Design of infrastructure, particularly of dams, will need to be re-visited to ensure that these will not be severely affected by the projected longer drier periods.

In areas where rainfall could be intense during wet periods, flooding events would follow and may pose danger to human settlements and infrastructure, in terms of landslides and mudslides, most especially, in geologically weak areas. Additionally, these flooding events could impact severely on public infrastructure, such as roads and bridges, including classrooms, evacuation centers, and hospitals.

Adaptive capacity is enhanced when impact and vulnerability assessments are used as the basis of strategic and long-term planning for adaptation. Assessments would indicate areas where critical water shortages can be expected leading to possible reduction of water available for domestic consumption, less irrigation service delivery, and possibly, decreased energy generation in dams. Note that the adverse impacts would cascade, so that long-term pro-active planning for these possible impacts is imperative in order to be able to respond effectively, and avoid maladaptations. A number of adaptation strategies should be considered. Among the wide array of cost effective options are rational water management, planning to avoid mismatch between water supply and demand through policies, upgrading/rehabilitation of dams where these are cost-effective, changes in cropping patterns in agricultural areas, establishing rain water collection facilities, where possible, and early warning systems.

4.2.2 Forestry

Changes in rainfall regimes and patterns resulting to increase/decrease in water use and temperature increases could lead to a change in the forests ecosystem, particularly in areas where the rains are severely limited, and can no longer provide favorable conditions for certain highly sensitive species. Some of our forests could face die-backs. Additionally, drier periods and warmer temperatures, especially during the warm phase of El Niño events, could cause forest fires. A very likely threat to communities that largely depend on the ecological services provided by forests is that they may face the need to alter their traditions and livelihoods. This change in practices and behavior can lead to further degradation of the environment as they resort to more extensive agricultural production in already degraded areas.

Adverse impacts on forestry areas and resources could be expected to multiply in a future warmer world. The value of impact and vulnerability assessments could not be underscored. These assessments would help decision makers and stakeholders identify the best option to address the different impacts on forest areas, watersheds and agroforestry. Indigenous communities have to plan for climate-resilient alternative livelihoods. Thus, it is highly important to plan for rational forest management, particularly, in protected areas and in ancestral domains. One of the more important issues to consider is how to safeguard livelihoods in affected communities so as not to further exacerbate land degradation. Early warning systems in this sector will play a very important role in forest protection through avoidance and control/containment of forest fires.

4.2.3 Agriculture

Agriculture in the country could be severely affected by temperature changes coupled with changes in rain regimes and patterns. Crops have been shown to suffer decreases in yields whenever temperatures have exceeded threshold values and possibly result to spikelet sterility, as in the case of rice. The reduction in crop yield would remain unmitigated or even aggravated if management technologies are not put in place. Additionally, in areas where rain patterns change or when extreme events such as floods or droughts happen more often, grain and other agricultural produce could suffer shortfalls in the absence of effective and timely interventions. Tropical cyclones, particularly if there will be an increase in numbers and/or strength will continue to exert pressure on agricultural production.

Moreover, temperature increases coupled with rainfall changes could affect the incidence/outbreaks of pests and diseases, both in plants and animals. The pathways through which diseases and pests could be triggered and rendered most favorable to spread are still largely unknown. It is therefore important that research focus on these issues.

In the fisheries sub-sector, migration of fish to cooler and deeper waters would force the fisher folks to travel further from the coasts in order to increase their catch. Seaweed production, already being practiced as an adaptation to climate change in a number of poor and depressed coastal communities could also be impacted adversely.

Decreased yields and inadequate job opportunities in the agricultural sector could lead to migration and shifts in population, resulting to more pressure in already depressed urban areas, particularly in mega cities. Food security will largely be affected, especially if timely, effective and efficient interventions are not put in place. Insufficient food supply could further lead to more malnutrition, higher poverty levels, and possibly, heightened social unrest and conflict in certain areas in the country, and even among the indigenous tribes.

A careful assessment of primary and secondary impacts in this sector, particularly, in production systems and livelihoods will go a long way in avoiding food security and livelihood issues. Proactive planning (short- and long-term adaptation measures) will help in attaining poverty eradication, sufficient nutrition and secure livelihoods goals. There is a wide cross-section of adaptation strategies that could be put in place, such as horizontal and vertical diversification of crops, farmer field schools which incorporate use of weather/climate information in agricultural operations, including policy environment for subsidies and climate-friendly agricultural technologies, weather-based insurance, and others. To date, there has not been much R&D that has been done on inland and marine fisheries technologies, a research agenda on resilient marine sector could form part of long-term planning for this subsector.

4.2.4 Coastal Resources

The country's coastal resources are highly vulnerable due to its extensive coastlines. Sea level rise is highly likely in a changing climate, and low-lying islands will face permanent inundation in the future. The combined effects of continued temperature increases, changes in rainfall and accelerated sea level rise, and tropical cyclone occurrences including the associated storm surges would expose coastal communities to higher levels of threat to life and property. The livelihood of these communities would also be threatened in terms of further stress to their fishing opportunities, loss of productive agricultural lands and saltwater intrusion, among others.

Impact and vulnerability assessment as well as adaptation planning for these coastal areas are of high priority. Adaptation measures range from physical structures such as sea walls where they still are cost-effective, to development/revision of land use plans using risk maps as the basis, to early warning systems for severe weather, including advisories on storm surge probabilities, as well as planning for and developing resilient livelihoods where traditional fishing/ agriculture are no longer viable.

4.2.5 Health

Human health is one of the most vital sectors which will be severely affected by climate change. Incremental increases in temperatures and rain regimes could trigger a number of adverse impacts; in particular, the outbreak and spread of water-based and vector-borne diseases leading to higher morbidity and mortality; increased incidence of pulmonary illnesses among young children and cardiovascular diseases among the elderly. In addition, there could also be increased health risk from poor air quality especially in urbanized areas.

Surveillance systems and infrastructure for monitoring and prevention of epidemics could also be under severe stress when there is a confluence of circumstances. Hospitals and clinics, and evacuation centers and resettlement areas could also be severely affected under increased frequency and intensity of severe weather events.

Moreover, malnutrition is expected to become more severe with more frequent occurrences of extreme events that disrupt food supply and provision of health services. The services of the Department of Health will be severely tested unless early and periodic assessments of plausible impacts of climate change are undertaken.

4.3 Conclusion

Scientific assessments have indicated that the Earth is now committed to continued and faster warming unless drastic global mitigation action is put in place the soonest. The likely impacts of climate change are numerous and most could seriously hinder the realization of targets set under the Millennium Development Goals; and thus, sustainable development. Under the UNFCCC, Country Parties have common but differentiated responsibilities. All Country Parties share the common responsibility of

protecting the climate system but must shoulder different responsibilities. This means that the developed countries including those whose economies are in transition (or the so-called Annex 1 Parties) have an obligation to reduce their greenhouse gas emissions based on their emissions at 1990 levels and provide assistance to developing countries (or the so-called non-Annex 1 Parties) to adapt to impacts of climate change.

In addition, the commitment to mitigate or reduce anthropogenic greenhouse gas emissions by countries which share the responsibility of having historically caused this global problem, as agreed upon in the Kyoto Protocol, is dictated by the imperative to avoid what climate scientists refer to as the "climate change tipping point". Tipping point is defined as the maximum temperature increase that could happen within the century, which could lead to sudden and dramatic changes to some of the major geophysical elements of the Earth. The effects of these changes could be varied from a dramatic rise in sea levels that could flood coastal regions to widespread crop failures. But, it still is possible to avoid them with cuts in anthropogenic greenhouse gases, both in the developed and developing countries, in particular, those which are now fast approaching the emission levels seen in rich countries.

In the Philippines, there are now a number of assisted climate change adaptation programmes and projects that are being implemented. Among these are the Millennium Development Goals Fund 1656: Strengthening the Philippines' Institutional Capacity to Adapt to Climate Change funded by the Government of Spain, the Philippine Climate Change Adaptation Project (which aims to develop the resiliency and test adaptation strategies that will develop the resiliency of farms and natural resource management to the effects of climate change) funded by the Global Environmental Facility(GEF) through the World Bank, the Adaptation to Climate Change and Conservation of Biodiversity Project and the National Framework Strategy on Climate Change (envisioned to develop the adaptation capacity of communities), both funded by the GTZ, Germany.

Table 1a: Projected temperature increase (in °C) under high-range and medium-range emission scenarios in 2020 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	25.3	28.1	28.3	27.4	0.8	0.9	0.9	0.9	0.8	1.0	0.8	0.9
ILOCOS SUR	23.1	25.7	25.4	24.8	0.7	0.8	0.7	0.8	0.9	1.1	0.8	1.0
LA UNION	20.5	22.9	22.8	22.2	0.7	0.8	0.7	0.8	0.9	1.1	0.7	1.0
PANGASINAN	25.0	27.4	26.9	26.4	0.7	0.9	0.8	0.8	0.9	1.1	0.9	1.0
CAR												
ABRA	24.5	27.4	27.2	26.4	0.7	0.8	0.8	0.8	0.8	1.0	0.8	0.9
APAYAO	24.8	28.0	28.4	27.1	0.5	0.8	0.7	0.7	0.8	0.9	0.9	0.8
BENGUET	19.4	21.9	22.0	21.2	0.6	0.8	0.7	0.8	0.9	1.0	0.8	1.0
IFUGAO	22.2	25.6	25.8	24.5	0.5	0.7	0.8	0.7	0.9	0.9	0.9	0.9
KALINGA	23.8	27.5	27.7	26.1	0.5	0.8	0.8	0.7	0.8	0.9	0.9	0.8
MOUNTAIN PROVINCE	22.7	26.0	26.1	24.9	0.5	0.8	0.8	0.7	0.9	0.9	0.9	0.9
Region 2												
CAGAYAN	24.5	28.1	28.9	27.1	0.5	0.8	0.8	0.7	0.8	1.0	0.9	0.8
ISABELA	24.1	27.9	28.7	26.8	0.5	0.8	0.8	0.7	0.8	0.9	0.9	0.8
NUEVA VIZCAYA	22.3	25.1	25.4	24.4	0.5	0.8	0.8	0.7	0.9	1.0	0.9	0.9
QUIRINO	23.7	26.8	27.6	26.2	0.5	0.8	0.8	0.7	0.9	1.0	1.0	0.9
Region 3												
AURORA	24.5	27.1	27.9	26.7	0.6	0.8	0.8	0.7	0.9	0.9	1.0	1.0
BATAAN	26.4	28.7	27.6	27.3	0.7	0.9	0.7	0.9	1.0	1.1	0.8	1.0
BULACAN	25.6	27.9	27.1	26.7	0.6	0.8	0.8	0.7	0.9	1.1	0.9	1.0
NUEVA ECIJA	25.3	27.7	27.5	26.8	0.6	0.8	0.8	0.8	0.9	1.1	0.9	1.0
PAMPANGA	26.0	28.3	27.5	27.1	0.6	0.9	0.8	0.8	1.0	1.1	0.9	1.0
TARLAC	26.1	28.3	27.8	27.3	0.7	0.8	0.8	0.8	1.1	1.1	1.0	1.1
ZAMBALES	26.3	28.3	27.4	27.2	0.7	0.9	0.8	0.9	1.0	1.1	0.9	1.0
Region 4-A												
BATANGAS	24.2	26.5	25.9	25.6	0.5	0.8	0.6	0.7	1.0	1.2	0.9	1.0
CAVITE	25.7	28.2	27.3	26.9	0.5	0.8	0.7	0.7	1.0	1.2	0.9	1.0
LAGUNA	25.0	27.5	27.5	26.7	0.5	0.7	0.7	0.6	0.9	1.1	1.0	0.9
QUEZON	25.1	27.2	27.6	26.7	0.6	0.7	0.7	0.6	0.9	1.1	1.0	0.9
RIZAL	25.4	27.9	27.6	26.8	0.5	0.8	0.7	0.6	0.9	1.1	0.9	1.0
Region 4-B												
OCCIDENTAL MINDORO	26.5	28.3	27.3	27.1	0.6	0.8	0.7	0.8	0.9	1.1	0.9	1.0
ORIENTAL MINDORO	26.4	28.3	27.6	27.3	0.6	0.7	0.7	0.6	0.8	1.0	1.1	0.9
PALAWAN	26.9	28.1	27.3	27.4	0.7	0.7	0.7	0.8	0.9	1.1	1.0	0.9
NCR												
METRO MANILA	26.1	28.8	28.0	27.4	0.5	0.8	0.7	0.7	1.0	1.1	0.9	1.0
Region 5												
ALBAY	25.6	27.2	27.8	27.1	0.6	0.7	0.6	0.7	0.9	1.2	0.9	0.9
CAMARINES NORTE	25.7	27.6	28.3	27.3	0.6	0.8	0.7	0.6	0.9	1.1	1.0	0.9
CAMARINES SUR	25.6	27.5	28.1	27.1	0.6	0.8	0.6	0.6	0.9	1.1	1.0	0.9
CATANDUANES	24.7	26.3	27.2	26.4	0.6	0.7	0.7	0.7	0.8	1.0	1.0	0.8
MASBATE	26.6	28.4	28.6	28.0	0.6	0.7	0.7	0.6	0.9	1.2	1.0	0.9
SORSOGON	25.9	27.4	27.9	27.3	0.6	0.7	0.7	0.7	0.8	1.1	0.9	0.9

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	26.1	27.9	27.8	27.4	0.7	0.8	0.7	0.7	1.0	1.2	1.0	0.9
ANTIQUE	26.6	28.4	27.9	27.7	0.7	0.8	0.7	0.8	1.0	1.2	0.9	0.9
CAPIZ	25.9	27.7	27.8	27.3	0.7	0.8	0.7	0.7	0.9	1.2	1.1	1.0
ILOILO	26.4	28.2	27.9	27.6	0.7	0.8	0.7	0.8	1.0	1.3	1.1	1.0
NEGROS OCCIDENTAL	26.7	28.4	27.8	27.6	0.7	0.8	0.6	0.8	0.9	1.2	1.0	1.0
Region 7												
BOHOL	26.6	28.0	28.2	27.8	0.7	0.7	0.7	0.8	0.9	1.2	1.2	1.0
CEBU	26.8	28.4	28.2	27.9	0.7	0.8	0.7	0.7	0.9	1.2	1.1	1.0
NEGROS ORIENTAL	27.0	28.4	28.0	27.8	0.7	0.7	0.7	0.8	0.9	1.2	1.0	1.0
Region 8												
EASTERN SAMAR	26.1	27.7	28.3	27.7	0.6	0.7	0.7	0.6	0.8	1.1	1.1	1.0
LEYTE	26.4	27.8	28.0	27.7	0.7	0.8	0.7	0.7	0.9	1.2	1.1	1.0
NORTHERN SAMAR	26.0	27.5	28.3	27.5	0.6	0.8	0.7	0.7	0.9	1.2	1.0	0.9
SAMAR	26.3	27.9	28.4	27.8	0.7	0.8	0.6	0.7	0.9	1.2	1.0	1.0
SOUTHERN LEYTE	26.4	27.7	27.8	27.5	0.7	0.6	0.7	0.7	0.9	1.1	1.2	1.0
Region 9												
ZAMBOANGA DEL NORTE	27.0	27.9	27.6	27.5	0.8	0.7	0.7	0.8	1.0	1.1	1.1	1.0
ZAMBOANGA DEL SUR	26.8	27.6	27.3	27.2	0.8	0.6	0.7	0.8	0.9	1.1	1.0	1.0
ZAMBOANGA SIBUGAY	27.1	27.9	27.5	27.5	0.8	0.6	0.6	0.8	1.0	1.0	1.0	1.0
Region 10												
BUKIDNON	25.1	26.5	25.8	25.7	0.8	0.8	0.8	0.9	1.0	1.2	1.2	1.0
LANAO DEL NORTE	24.4	25.5	25.4	25.2	0.8	0.7	0.7	0.8	1.0	1.1	1.0	1.0
MISAMIS OCCIDENTAL	25.6	26.7	26.6	26.4	0.7	0.6	0.7	0.7	1.0	1.1	1.1	1.0
MISAMIS ORIENTAL	25.4	26.8	26.9	26.5	0.8	0.8	0.9	0.8	1.0	1.2	1.2	1.0
Region 11												
COMPOSTELA VALLEY	26.7	27.8	27.6	27.6	0.8	0.7	0.8	0.8	0.9	1.1	1.2	1.1
DAVAO DEL NORTE	26.7	27.8	27.4	27.4	0.8	0.7	0.8	0.8	0.9	1.1	1.2	1.1
DAVAO DEL SUR	26.9	27.8	26.9	27.1	0.8	0.7	0.7	0.8	0.9	1.1	1.1	1.0
DAVAO ORIENTAL	26.8	27.8	27.5	27.6	0.8	0.6	0.7	0.8	0.9	1.0	1.1	1.0
Region 12												
NORTH COTABATO	26.8	27.9	27.0	27.1	0.9	0.7	0.8	0.9	1.0	1.3	1.2	1.1
SARANGANI	27.7	28.4	27.3	27.6	0.9	0.7	0.7	0.8	0.9	1.2	1.1	1.0
SOUTH COTABATO	27.7	28.5	27.4	27.7	0.8	0.7	0.8	0.8	1.0	1.2	1.1	1.1
SULTAN KUDARAT	27.8	28.6	27.6	27.8	0.8	0.7	0.8	0.8	1.0	1.2	1.1	1.0
CARAGA												
AGUSAN DEL NORTE	26.2	27.6	27.8	27.4	0.7	0.7	0.8	0.8	1.0	1.2	1.3	1.1
AGUSAN DEL SUR	25.9	27.1	27.2	26.9	0.7	0.7	0.8	0.8	0.9	1.1	1.1	1.1
SURIGAO DEL NORTE	26.3	27.6	28.2	27.7	0.8	0.7	0.8	0.8	0.9	1.1	1.3	1.1
SURIGAO DEL SUR	26.4	27.4	27.9	27.4	0.7	0.6	0.7	0.7	0.9	1.0	1.1	1.1
ARMM												
LANAO DEL SUR	24.3	25.4	25.0	24.9	0.8	0.7	0.8	0.8	1.0	1.2	1.1	1.0
MAGUINDANAO	27.6	28.3	27.5	27.6	0.9	0.6	0.8	0.8	1.0	1.2	1.2	1.1

Table 1b: Projected temperature increase (in °C) under high-range and medium-range emission scenarios in 2050 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	DJF	MAM	JJA	DJF	MAM	JJA	DJF	MAM	JJA
Region 1												
ILOCOS NORTE	25.3	28.1	28.3	27.4	1.6	1.8	1.6	1.9	2.1	2.2	1.7	1.8
ILOCOS SUR	23.1	25.7	25.4	24.8	1.5	1.7	1.5	1.8	2.0	2.1	1.6	1.8
LA UNION	20.5	22.9	22.8	22.2	1.5	1.7	1.5	1.8	2.0	2.1	1.6	1.8
PANGASINAN	25.0	27.4	26.9	26.4	1.7	1.8	1.6	2.0	2.2	2.2	1.8	2.0
CAR												
ABRA	24.5	27.4	27.2	26.4	1.5	1.8	1.6	1.8	2.0	2.1	1.6	1.9
APAYAO	24.8	28.0	28.4	27.1	1.2	1.8	1.7	1.7	1.9	2.1	1.9	1.8
BENGUET	19.4	21.9	22.0	21.2	1.5	1.7	1.6	1.8	2.0	2.1	1.7	1.9
IFUGAO	22.2	25.6	25.8	24.5	1.2	1.7	1.7	1.7	1.9	2.1	2.0	1.9
KALINGA	23.8	27.5	27.7	26.1	1.3	1.8	1.7	1.8	1.9	2.1	2.0	1.9
MOUNTAIN PROVINCE	22.7	26.0	26.1	24.9	1.3	1.7	1.7	1.8	1.9	2.1	1.9	1.9
Region 2												
CAGAYAN	24.5	28.1	28.9	27.1	1.3	1.9	1.7	1.8	2.0	2.2	2.0	1.8
ISABELA	24.1	27.9	28.7	26.8	1.4	1.9	1.7	1.8	2.0	2.1	2.1	1.9
NUEVA VIZCAYA	22.3	25.1	25.4	24.4	1.4	1.8	1.8	1.7	2.0	2.1	1.9	1.9
QUIRINO	23.7	26.8	27.6	26.2	1.4	1.9	1.8	1.8	2.0	2.2	2.0	2.0
Region 3												
AURORA	24.5	27.1	27.9	26.7	1.4	1.7	1.7	1.6	1.9	2.0	2.0	2.0
BATAAN	26.4	28.7	27.6	27.3	1.6	1.8	1.6	1.9	2.0	2.1	1.7	1.9
BULACAN	25.6	27.9	27.1	26.7	1.4	1.8	1.7	1.7	1.9	2.1	1.7	1.9
NUEVA ECIJA	25.3	27.7	27.5	26.8	1.5	1.7	1.7	1.8	2.0	2.1	1.8	2.0
PAMPANGA	26.0	28.3	27.5	27.1	1.5	1.8	1.7	1.8	2.1	2.2	1.8	2.0
TARLAC	26.1	28.3	27.8	27.3	1.6	1.8	1.7	1.9	2.2	2.2	1.9	2.1
ZAMBALES	26.3	28.3	27.4	27.2	1.6	1.8	1.6	1.9	2.1	2.1	1.7	1.9
Region 4-A												
BATANGAS	24.2	26.5	25.9	25.6	1.4	1.8	1.6	1.7	1.9	2.2	1.8	1.9
CAVITE	25.7	28.2	27.3	26.9	1.4	1.8	1.6	1.8	2.0	2.2	1.8	1.9
LAGUNA	25.0	27.5	27.5	26.7	1.3	1.8	1.7	1.6	1.8	2.1	1.9	1.9
QUEZON	25.1	27.2	27.6	26.7	1.4	1.8	1.7	1.6	1.8	2.1	2.0	1.8
RIZAL	25.4	27.9	27.6	26.8	1.3	1.8	1.6	1.6	1.9	2.1	1.8	1.9
Region 4-B												
OCCIDENTAL MINDORO	26.5	28.3	27.3	27.1	1.5	1.7	1.7	1.8	1.9	2.1	1.8	1.9
ORIENTAL MINDORO	26.4	28.3	27.6	27.3	1.4	1.7	1.7	1.5	1.8	2.0	2.2	1.9
PALAWAN	26.9	28.1	27.3	27.4	1.7	1.6	1.6	1.8	1.8	2.1	2.0	1.8
NCR												
METRO MANILA	26.1	28.8	28.0	27.4	1.3	1.8	1.6	1.7	2.0	2.1	1.8	1.9
Region 5												
ALBAY	25.6	27.2	27.8	27.1	1.5	1.9	1.6	1.6	1.8	2.2	1.9	1.8
CAMARINES NORTE	25.7	27.6	28.3	27.3	1.5	2.0	1.8	1.6	1.8	2.2	2.1	1.8
CAMARINES SUR	25.6	27.5	28.1	27.1	1.5	1.9	1.7	1.6	1.8	2.2	2.0	1.8
CATANDUANES	24.7	26.3	27.2	26.4	1.4	1.7	1.6	1.6	1.6	2.0	1.9	1.7
MASBATE	26.6	28.4	28.6	28.0	1.5	2.0	1.7	1.7	1.8	2.4	2.1	1.8
SORSOGON	25.9	27.4	27.9	27.3	1.5	1.8	1.6	1.7	1.6	2.1	1.8	1.5

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	DJF	MAM	JJA	DJF	MAM	JJA	DJF	MAM	JJA
Region 6												
AKLAN	26.1	27.9	27.8	27.4	1.7	2.1	1.7	1.7	1.9	2.4	2.1	1.8
ANTIQUE	26.6	28.4	27.9	27.7	1.7	1.9	1.7	1.9	1.9	2.2	1.9	1.8
CAPIZ	25.9	27.7	27.8	27.3	1.6	2.0	1.7	1.6	1.9	2.4	2.2	1.9
ILOILO	26.4	28.2	27.9	27.6	1.6	2.0	1.7	1.7	1.9	2.4	2.1	1.9
NEGROS OCCIDENTAL	26.7	28.4	27.8	27.6	1.7	2.0	1.6	1.8	1.9	2.3	2.0	1.9
Region 7												
BOHOL	26.6	28.0	28.2	27.8	1.7	1.9	1.7	1.8	1.8	2.3	2.3	1.9
CEBU	26.8	28.4	28.2	27.9	1.7	2.0	1.7	1.7	1.9	2.4	2.1	1.9
NEGROS ORIENTAL	27.0	28.4	28.0	27.8	1.8	1.9	1.6	1.8	1.9	2.3	2.0	1.9
Region 8												
EASTERN SAMAR	26.1	27.7	28.3	27.7	1.4	1.8	1.7	1.5	1.7	2.1	2.2	1.8
LEYTE	26.4	27.8	28.0	27.7	1.6	1.9	1.7	1.7	1.8	2.3	2.2	1.9
NORTHERN SAMAR	26.0	27.5	28.3	27.5	1.5	2.1	1.7	1.6	1.8	2.4	2.0	1.7
SAMAR	26.3	27.9	28.4	27.8	1.6	2.0	1.6	1.7	1.8	2.4	2.1	1.8
SOUTHERN LEYTE	26.4	27.7	27.8	27.5	1.5	1.6	1.8	1.6	1.7	2.1	2.3	1.9
Region 9												
ZAMBOANGA DEL NORTE	27.0	27.9	27.6	27.5	1.8	1.7	1.7	1.9	2.0	2.1	2.2	2.0
ZAMBOANGA DEL SUR	26.8	27.6	27.3	27.2	1.7	1.6	1.6	1.8	1.9	2.1	2.0	1.9
ZAMBOANGA SIBUGAY	27.1	27.9	27.5	27.5	1.9	1.5	1.6	1.8	2.0	2.0	1.9	2.0
Region 10												
BUKIDNON	25.1	26.5	25.8	25.7	1.7	1.9	1.7	1.7	1.9	2.3	2.4	2.1
LANAO DEL NORTE	24.4	25.5	25.4	25.2	1.6	1.7	1.7	1.7	1.9	2.2	2.1	1.9
MISAMIS OCCIDENTAL	25.6	26.7	26.6	26.4	1.5	1.6	1.6	1.6	1.9	2.2	2.2	1.9
MISAMIS ORIENTAL	25.4	26.8	26.9	26.5	1.6	2.0	1.7	1.7	1.9	2.3	2.4	2.0
Region 11												
COMPOSTELA VALLEY	26.7	27.8	27.6	27.6	1.7	1.8	1.6	1.6	1.9	2.3	2.4	2.1
DAVAO DEL NORTE	26.7	27.8	27.4	27.4	1.7	1.8	1.6	1.6	1.9	2.3	2.5	2.1
DAVAO DEL SUR	26.9	27.8	26.9	27.1	1.7	1.6	1.6	1.6	1.9	2.2	2.3	2.0
DAVAO ORIENTAL	26.8	27.8	27.5	27.6	1.7	1.6	1.5	1.5	1.8	2.0	2.4	2.0
Region 12												
NORTH COTABATO	26.8	27.9	27.0	27.1	2.0	1.8	1.8	1.8	2.1	2.5	2.4	2.1
SARANGANI	27.7	28.4	27.3	27.6	1.8	1.8	1.6	1.6	1.9	2.4	2.2	2.0
SOUTH COTABATO	27.7	28.5	27.4	27.7	1.8	1.7	1.7	1.7	2.0	2.3	2.2	2.1
SULTAN KUDARAT	27.8	28.6	27.6	27.8	1.8	1.7	1.7	1.7	2.0	2.2	2.2	2.0
CARAGA												
AGUSAN DEL NORTE	26.2	27.6	27.8	27.4	1.6	1.9	1.7	1.7	1.9	2.3	2.5	2.2
AGUSAN DEL SUR	25.9	27.1	27.2	26.9	1.6	1.7	1.5	1.5	1.9	2.2	2.4	2.1
SURIGAO DEL NORTE	26.3	27.6	28.2	27.7	1.5	1.8	1.8	1.7	1.7	2.2	2.6	2.0
SURIGAO DEL SUR	26.4	27.4	27.9	27.4	1.5	1.6	1.5	1.5	1.7	2.0	2.3	2.0
ARMM												
LANAO DEL SUR	24.3	25.4	25.0	24.9	1.8	1.8	1.8	1.7	2.0	2.3	2.2	2.0
MAGUINDANAO	27.6	28.3	27.5	27.6	1.9	1.7	1.8	1.8	2.1	2.3	2.4	2.1

Table 1c: Projected temperature increase (in °C) under low-range emission scenarios in 2020 based on 1990-2000 normal values

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 1				
ILOCOS NORTE	0.3	0.6	0.7	0.9
ILOCOS SUR	0.6	0.4	0.3	0.2
LA UNION	0.5	0.4	0.2	0.3
PANGASINAN	0.4	0.5	0.4	0.2
CAR				
ABRA	0.5	0.6	0.6	0.4
APAYAO	0.4	0.5	0.4	0.4
BENGUET	0.2	0.5	0.7	0.5
IFUGAO	0.2	0.5	0.6	0.3
KALINGA	0.2	0.4	0.5	0.8
MOUNTAIN PROVINCE	0.4	0.5	0.6	0.6
Region 2				
CAGAYAN	0.3	0.5	0.6	0.7
ISABELA	0.6	0.4	0.4	0.2
NUEVA VIZCAYA	0.5	0.5	0.5	0.4
QUIRINO	0.2	0.5	0.6	0.7
Region 3				
AURORA	0.3	0.5	0.8	0.6
BATAAN	0.4	0.6	0.6	0.3
BULACAN	0.5	0.6	0.5	0.4
NUEVA ECIJA	0.5	0.5	0.3	0.1
PAMPANGA	0.5	0.5	0.6	0.2
TARLAC	0.3	0.5	0.6	0.7
ZAMBALES	0.6	0.5	0.3	0.2
Region 4-A				
BATANGAS	0.5	0.4	0.3	0.3
CAVITE	0.5	0.5	0.4	0.4
LAGUNA	0.6	0.5	0.3	0.3
QUEZON	0.5	0.5	0.5	0.3
RIZAL	0.1	0.4	0.7	0.4
Region 4-B				
OCCIDENTAL MINDORO	0.3	0.8	0.6	0.9
ORIENTAL MINDORO	0.4	0.5	0.6	0.7
PALAWAN	0.5	0.5	0.3	0.2
NCR				
METRO MANILA	0.2	0.5	0.8	0.4
Region 5				
ALBAY	0.1	0.5	0.7	0.6
CAMARINES NORTE	0.4	0.5	0.6	0.6
CAMARINES SUR	0.4	0.5	0.7	0.6
CATANDUANES	0.4	0.5	0.5	0.3
MASBATE	0.5	0.5	0.5	0.3
SORSOGON	0.6	0.4	0.4	0.2

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 6				
AKLAN	0.6	0.6	0.6	0.4
ANTIQUE	0.5	0.5	0.5	0.4
CAPIZ	0.3	0.5	0.7	0.9
ILOILO	0.4	0.4	0.3	0.2
NEGROS OCCIDENTAL	0.5	0.4	0.3	0.2
Region 7				
BOHOL	0.2	0.5	0.6	0.6
CEBU	0.5	0.5	0.4	0.4
NEGROS ORIENTAL	0.6	0.5	0.4	0.4
Region 8				
EASTERN SAMAR	0.6	0.6	0.6	0.4
LEYTE	0.5	0.6	0.5	0.3
NORTHERN SAMAR	0.2	0.4	0.6	0.7
SAMAR	0.1	0.4	0.6	0.5
SOUTHERN LEYTE	0.3	0.4	0.5	0.6
Region 9				
ZAMBOANGA DEL NORTE	0.3	0.4	0.5	0.2
ZAMBOANGA DEL SUR	0.5	0.5	0.4	0.4
ZAMBOANGA SIBUGAY	0.2	0.4	0.6	0.8
Region 10				
BUKIDNON	0.4	0.5	0.6	0.7
LANAO DEL NORTE	0.4	0.5	0.6	0.4
MISAMIS OCCIDENTAL	0.2	0.5	0.7	0.4
MISAMIS ORIENTAL	0.3	0.5	0.7	0.8
Region 11				
COMPOSTELA VALLEY	0.5	0.4	0.3	0.6
DAVAO DEL NORTE	0.7	0.6	0.5	0.3
DAVAO DEL SUR	0.5	0.6	0.5	0.3
DAVAO ORIENTAL	0.6	0.5	0.5	0.4
Region 12				
NORTH COTABATO	0.5	0.6	0.5	0.4
SARANGANI	0.5	0.4	0.4	0.2
SOUTH COTABATO	0.5	0.6	0.5	0.4
SULTAN KUDARAT	0.5	0.4	0.3	0.0
CARAGA				
AGUSAN DEL NORTE	0.5	0.4	0.3	0.3
AGUSAN DEL SUR	0.3	0.4	0.6	0.7
SURIGAO DEL NORTE	0.3	0.4	0.5	0.8
SURIGAO DEL SUR	0.6	0.5	0.4	0.4
ARMM				
LANAO DEL SUR	0.6	0.5	0.4	0.4
MAGUINDANAO	0.7	0.5	0.4	0.4

Table 1d: Projected temperature increase (in °C) under low-range emission scenarios in 2050 based on 1990-2000 normal values

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 1				
ILOCOS NORTE	1.2	1.3	1.4	1.6
ILOCOS SUR	1.4	1.2	1.1	1.4
LA UNION	1.2	1.1	1.0	1.3
PANGASINAN	1.2	1.3	1.2	1.3
CAR				
ABRA	1.2	1.3	1.4	1.3
APAYAO	1.3	1.3	1.2	1.3
BENGUET	1.0	1.3	1.5	1.4
IFUGAO	1.1	1.2	1.5	1.3
KALINGA	1.1	1.2	1.3	1.5
MOUNTAIN PROVINCE	1.1	1.2	1.4	1.5
Region 2				
CAGAYAN	1.2	1.2	1.3	1.5
ISABELA	1.5	1.2	1.3	1.5
NUEVA VIZCAYA	1.4	1.3	1.2	1.4
QUIRINO	1.1	1.2	1.5	1.4
Region 3				
AURORA	1.2	1.4	1.5	1.5
BATAAN	1.2	1.3	1.4	1.3
BULACAN	1.2	1.3	1.4	1.3
NUEVA ECIJA	1.3	1.2	1.1	1.2
PAMPANGA	1.2	1.3	1.4	1.3
TARLAC	1.1	1.2	1.4	1.5
ZAMBALES	1.4	1.2	1.2	1.4
Region 4-A				
BATANGAS	1.4	1.2	1.1	1.3
CAVITE	1.3	1.2	1.2	1.3
LAGUNA	1.3	1.2	1.0	1.3
QUEZON	1.2	1.2	1.3	1.3
RIZAL	0.9	1.2	1.4	1.4
Region 4-B				
OCCIDENTAL MINDORO	1.3	1.5	1.4	1.6
ORIENTAL MINDORO	1.3	1.2	1.3	1.5
PALAWAN	1.2	1.2	1.2	1.3
NCR				
METRO MANILA	1.1	1.3	1.5	1.5
Region 5				
ALBAY	1.0	1.2	1.4	1.5
CAMARINES NORTE	1.3	1.2	1.3	1.5
CAMARINES SUR	1.1	1.2	1.5	1.4
CATANDUANES	1.3	1.2	1.2	1.3
MASBATE	1.4	1.2	1.2	1.3
SORSOGON	1.4	1.2	1.2	1.4

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 6				
AKLAN	1.5	1.4	1.4	1.4
ANTIQUE	1.2	1.2	1.3	1.3
CAPIZ	1.1	1.2	1.5	1.5
ILOILO	1.2	1.1	1.1	1.3
NEGROS OCCIDENTAL	1.3	1.2	1.1	1.3
Region 7				
BOHOL	1.0	1.2	1.4	1.4
CEBU	1.4	1.3	1.3	1.5
NEGROS ORIENTAL	1.5	1.3	1.3	1.6
Region 8				
EASTERN SAMAR	1.5	1.4	1.4	1.4
LEYTE	1.2	1.2	1.3	1.3
NORTHERN SAMAR	1.2	1.2	1.5	1.5
SAMAR	1.0	1.2	1.5	1.5
SOUTHERN LEYTE	1.2	1.2	1.3	1.4
Region 9				
ZAMBOANGA DEL NORTE	1.1	1.2	1.3	1.2
ZAMBOANGA DEL SUR	1.3	1.2	1.2	1.4
ZAMBOANGA SIBUGAY	1.1	1.2	1.4	1.5
Region 10				
BUKIDNON	1.4	1.3	1.4	1.6
LANAO DEL NORTE	1.1	1.2	1.4	1.3
MISAMIS OCCIDENTAL	1.0	1.2	1.5	1.5
MISAMIS ORIENTAL	1.1	1.2	1.5	1.4
Region 11				
COMPOSTELA VALLEY	1.4	1.2	1.1	1.4
DAVAO DEL NORTE	1.4	1.3	1.3	1.4
DAVAO DEL SUR	1.3	1.3	1.2	1.3
DAVAO ORIENTAL	1.3	1.2	1.3	1.3
Region 12				
NORTH COTABATO	1.4	1.3	1.2	1.3
SARANGANI	1.3	1.2	1.3	1.4
SOUTH COTABATO	1.4	1.3	1.3	1.4
SULTAN KUDARAT	1.3	1.2	1.3	1.4
CARAGA				
AGUSAN DEL NORTE	1.2	1.1	1.0	1.3
AGUSAN DEL SUR	1.3	1.3	1.4	1.5
SURIGAO DEL NORTE	1.3	1.3	1.4	1.5
SURIGAO DEL SUR	1.5	1.3	1.3	1.5
ARMM				
LANAO DEL SUR	1.4	1.2	1.2	1.4
MAGUINDANAO	1.6	1.3	1.2	1.5

Table 2a: Projected rainfall change (in %) under high-range and medium-range emission scenarios in 2020 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE (mm)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	49.8	185.5	1106.4	595.4	25.3	28.1	28.3	27.4	4.4	-3.1	18.0	5.8
ILOCOS SUR	17.5	288.8	1575.4	672.9	23.1	25.7	25.4	24.8	-4.6	-2.0	36.3	23.0
LA UNION	14.7	395.6	1852.3	837.8	20.5	22.9	22.8	22.2	-0.4	4.5	43.1	30.0
PANGASINAN	19.4	298.0	1608.9	707.8	25.0	27.4	26.9	26.4	54.3	-6.0	6.1	5.9
CAR												
ABRA	43.5	220.6	1218.9	634.4	-18.5	-11.7	3.5	-28.7	5.0	-1.8	22.3	14.0
APAYAO	144.6	184.0	822.7	720.1	-4.6	-13.6	4.3	-24.1	2.6	0.4	5.8	16.6
BENGUET	47.7	422.3	1734.9	931.8	-9.6	-10.6	4.4	-22.8	8.0	0.2	31.6	21.7
IFUGAO	102.6	321.0	1071.1	724.9	-3.6	-7.7	5.0	-12.5	-6.0	-9.6	14.4	8.9
KALINGA	92.3	228.0	892.3	691.9	-5.2	-6.0	4.5	-18.1	1.0	-9.1	4.5	14.8
MOUNTAIN PROVINCE	74.8	286.8	1121.1	699.2	-5.6	-8.1	4.8	-18.0	-2.7	-7.7	16.4	14.9
Region 2												
CAGAYAN	284.4	207.7	538.4	832.1	-3.5	-19.9	11.4	-23.9	6.9	-3.6	2.9	16.3
ISABELA	412.2	325.0	530.8	867.0	-11.7	-23.2	13.2	-13.1	3.9	-8.6	5.1	13.5
NUEVA VIZCAYA	180.9	416.8	1149.8	880.5	-23.5	-13.4	6.9	-17.1	-3.5	-8.6	20.1	9.8
QUIRINO	419.0	465.9	776.4	957.9	-37.2	-20.4	9.5	-15.7	-5.7	-18.2	9.7	6.1
Region 3												
AURORA	615.7	546.4	768.7	1151.1	-38.2	-19.2	10.9	-19.0	-0.3	-17.1	6.7	5.8
BATAAN	71.7	368.7	1326.2	872.6	-33.3	0.4	5.7	-19.1	2.7	-5.2	9.4	-0.4
BULACAN	212.4	288.9	1041.4	842.1	-25.3	-16.9	5.3	-19.9	4.2	-23.0	12.8	-2.9
NUEVA ECIJA	155.2	316.5	995.0	745.0	-30.3	-19.2	6.4	-18.1	7.5	-13.8	10.1	1.6
PAMPANGA	120.8	320.6	1030.4	785.2	-30.7	-6.3	-1.7	-15.4	16.3	-18.8	4.4	-5.1
TARLAC	43.4	265.4	1193.5	644.3	-18.1	-5.1	-1.6	-11.4	26.0	-13.7	-1.6	-9.6
ZAMBALES	40.9	368.0	1793.9	872.0	-21.6	-7.2	4.8	-22.3	34.2	-4.5	13.3	-1.6
Region 4-A												
BATANGAS	231.0	280.4	856.5	746.4	-38.8	-4.2	26.7	-6.0	-29.9	-24.1	9.1	0.5
CAVITE	124.9	242.8	985.7	579.0	-43.8	-9.8	15.6	-15.0	-26.1	-28.2	13.1	0.4
LAGUNA	629.2	386.8	845.0	1066.5	-31.6	-9.8	10.7	0.0	-20.2	-31.5	2.9	2.9
QUEZON	827.7	382.7	670.0	1229.3	-15.4	-1.7	21.6	2.8	-6.5	-18.6	2.9	5.2
RIZAL	262.4	241.5	1001.3	821.8	-42.1	-16.6	7.8	-18.6	-13.1	-30.7	12.4	-0.9
Region 4-B												
OCCIDENTAL MINDORO	159.5	265.9	1091.2	762.6	-31.7	1.1	18.8	-23.0	-14.3	-15.6	13.6	3.2
ORIENTAL MINDORO	260.3	269.3	894.3	791.2	-13.7	7.1	32.9	-2.4	-3.2	-15.1	0.5	6.2
PALAWAN	101.8	189.3	781.7	640.6	-9.3	1.9	6.8	-3.4	15.7	-7.2	-2.6	19.6
NCR												
METRO MANILA	107.5	198.5	1170.2	758.7	-53.2	-17.3	6.8	-19.1	-12.8	-33.3	8.5	0.0
Region 5												
ALBAY	739.8	386.9	705.8	941.3	-1.5	8.9	28.2	-9.0	0.5	-11.1	14.3	6.4
CAMARINES NORTE	1029.6	398.5	565.6	1285.7	-11.7	-0.6	23.6	4.3	0.0	-17.8	5.2	7.8
CAMARINES SUR	666.8	347.4	639.6	1029.4	-10.8	2.3	27.2	-1.6	2.0	-14.9	9.5	5.8
CATANDUANES	1075.4	512.7	646.3	1199.5	-4.6	17.8	16.1	-8.4	13.6	-7.0	16.3	8.7
MASBATE	510.2	250.7	569.4	739.3	-11.0	13.6	23.1	-4.1	-1.1	-6.5	23.4	12.5
SORSOGON	958.1	427.9	660.4	973.6	-4.5	12.5	20.3	-7.0	5.1	-6.8	14.6	10.8



PROVINCES	OBSERVED BASELINE (mm)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	431.2	322.7	862.5	883.7	-22.7	5.1	9.5	-5.3	3.9	-8.8	-4.0	16.9
ANTIQUE	297.9	288.0	995.3	841.4	-34.2	1.1	12.5	-10.2	-17.2	-12.8	9.8	14.6
CAPIZ	469.7	342.0	814.2	889.1	-19.7	1.6	6.7	-1.0	4.6	-5.8	-3.4	18.2
ILOILO	324.8	290.6	932.8	828.3	-26.7	-2.0	8.8	1.0	1.2	-8.6	-0.6	11.5
NEGROS OCCIDENTAL	234.9	283.0	899.6	784.0	-16.8	2.6	11.6	-5.7	7.1	-3.7	6.0	5.7
Region 7												
BOHOL	376.1	209.6	412.9	514.5	-11.1	9.5	11.3	-6.7	9.8	-7.1	4.5	6.8
CEBU	324.0	228.3	595.1	607.4	-7.8	2.3	9.7	-3.4	17.7	0.8	7.7	7.7
NEGROS ORIENTAL	225.8	226.0	639.5	636.9	-14.9	3.3	7.9	-5.2	15.0	-4.9	9.3	4.7
Region 8												
EASTERN SAMAR	987.0	464.1	559.8	871.4	-11.1	1.4	11.9	-16.8	3.1	-11.3	2.2	8.1
LEYTE	689.5	342.0	568.7	725.5	-14.4	-4.4	14.5	-15.3	3.0	-8.9	9.5	7.4
NORTHERN SAMAR	1128.9	462.2	566.8	981.4	-8.9	16.6	16.4	-10.4	0.8	-9.6	15.1	6.5
SAMAR	889.5	437.0	599.8	879.4	6.0	18.0	17.6	-19.3	-8.3	-16.0	11.7	5.0
SOUTHERN LEYTE	818.6	362.2	510.6	695.6	-12.4	-0.7	15.0	-2.8	9.7	-5.0	5.7	7.2
Region 9												
ZAMBOANGA DEL NORTE	324.5	279.7	599.1	718.1	-12.7	16.3	4.0	-7.6	11.0	3.2	-3.2	13.8
ZAMBOANGA DEL SUR	294.5	298.7	593.8	663.2	-16.3	14.6	6.6	-3.1	11.2	2.2	-0.4	13.8
ZAMBOANGA SIBUGAY	284.1	290.5	597.2	674.1	-7.7	14.6	8.7	-8.6	9.9	6.6	6.5	14.8
Region 10												
BUKIDNON	329.7	335.6	653.8	559.5	-23.4	0.1	-1.5	5.7	2.9	-10.3	-4.4	-0.3
LANAO DEL NORTE	337.5	350.3	662.5	621.1	-21.0	9.0	2.9	1.6	9.6	-0.6	-2.2	6.9
MISAMIS OCCIDENTAL	392.1	323.4	633.1	728.3	-16.0	18.3	2.9	-0.5	9.1	1.4	-6.1	6.1
MISAMIS ORIENTAL	442.5	296.0	615.7	581.1	-19.5	-2.0	3.7	-2.4	4.6	-10.4	-3.7	2.9
Region 11												
COMPOSTELA VALLEY	748.1	559.0	546.7	586.6	-7.9	-0.8	-0.2	0.4	10.2	-11.3	-2.7	0.3
DAVAO DEL NORTE	637.0	496.5	535.6	556.2	-10.1	0.2	-0.1	2.2	9.2	-12.5	-3.6	-1.5
DAVAO DEL SUR	288.1	347.1	494.1	442.3	-11.5	1.1	-2.9	7.0	18.1	-9.8	-7.8	-2.4
DAVAO ORIENTAL	827.3	611.8	540.4	599.2	0.3	1.8	-1.6	3.2	12.3	-5.7	-4.7	1.2
Region 12												
NORTH COTABATO	235.4	353.2	572.5	486.0	-13.8	7.4	-2.7	8.1	14.8	-5.9	-6.1	1.6
SARANGANI	212.3	212.6	333.6	302.5	-15.4	-4.1	-7.8	10.6	10.1	-12.1	-9.3	-1.7
SOUTH COTABATO	183.3	234.1	402.8	351.7	-16.5	2.2	-10.8	12.7	10.1	-8.7	-12.1	-6.8
SULTAN KUDARAT	189.3	311.0	513.1	448.7	-12.9	5.4	-6.4	8.4	6.1	-2.3	-9.2	2.9
CARAGA												
AGUSAN DEL NORTE	875.7	441.9	460.0	628.9	-8.3	-5.1	3.2	-13.3	-0.8	-24.4	-7.9	5.0
AGUSAN DEL SUR	963.3	586.4	593.4	694.8	-15.9	-4.4	5.5	2.7	4.0	-13.1	0.0	-6.0
SURIGAO DEL NORTE	1412.0	639.6	448.0	837.3	-12.1	-1.3	8.7	-18.9	2.1	-11.7	-3.3	4.2
SURIGAO DEL SUR	1394.0	746.9	534.6	842.5	-9.9	0.1	6.9	-1.8	5.8	-11.7	-2.2	-4.8
ARMM												
LANAO DEL SUR	293.8	369.4	661.5	562.2	-20.9	1.4	-0.7	7.6	7.2	-6.3	-7.2	0.3
MAGUINDANAO	225.3	399.1	635.3	553.6	-14.6	7.5	-0.2	4.9	6.3	1.4	-7.4	3.5

Table 2b: Projected rainfall change (in %) under high-range and medium-range emission scenarios in 2050 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE (mm)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	49.8	185.5	1106.4	595.4	-42.2	7.7	-1.3	-33.1	-18.8	-31.3	20.9	4.7
ILOCOS SUR	17.5	288.8	1575.4	672.9	-21.4	14.7	1.9	-5.3	-0.1	-27.6	58.1	33.3
LA UNION	14.7	395.6	1852.3	837.8	-12.4	2.9	1.2	1.2	-1.1	-24.6	72.5	39.0
PANGASINAN	19.4	298.0	1608.9	707.8	-33.2	-14.8	1.4	-2.0	1.1	-11.2	22.9	11.9
CAR												
ABRA	43.5	220.6	1218.9	634.4	-28.3	17.2	4.2	-26.1	-2.1	-28.1	35.0	15.9
APAYAO	144.6	184.0	822.7	720.1	0.9	-8.5	1.1	-18.9	3.0	-23.7	1.1	-0.3
BENGUET	47.7	422.3	1734.9	931.8	-15.0	-5.1	-0.9	0.8	-6.0	-26.7	63.1	21.8
IFUGAO	102.6	321.0	1071.1	724.9	-2.3	-6.3	3.3	4.4	-1.3	-24.2	17.6	-2.9
KALINGA	92.3	228.0	892.3	691.9	-1.7	0.0	4.7	-2.1	4.2	-21.0	3.9	1.1
MOUNTAIN PROVINCE	74.8	286.8	1121.1	699.2	-7.0	-0.9	2.8	1.0	1.1	-27.4	26.6	8.5
Region 2												
CAGAYAN	284.4	207.7	538.4	832.1	-8.3	-14.3	3.2	-25.5	14.6	-23.3	0.9	-1.0
ISABELA	412.2	325.0	530.8	867.0	-13.7	-12.1	-2.1	-7.1	25.1	-29.2	8.7	1.7
NUEVA VIZCAYA	180.9	416.8	1149.8	880.5	-22.6	-12.0	2.3	-0.4	-7.8	-23.6	36.1	-0.5
QUIRINO	419.0	465.9	776.4	957.9	-30.3	-18.6	-2.8	-3.3	-0.9	-33.9	12.9	-5.8
Region 3												
AURORA	615.7	546.4	768.7	1151.1	-33.7	-23.0	-1.2	-4.8	8.7	-29.2	7.4	-5.7
BATAAN	71.7	368.7	1326.2	872.6	-36.5	3.9	14.8	-6.3	-8.2	-8.1	29.1	1.5
BULACAN	212.4	288.9	1041.4	842.1	-34.7	-28.1	3.3	-5.7	-13.2	-36.4	23.6	-3.3
NUEVA ECIJA	155.2	316.5	995.0	745.0	-43.2	-23.1	7.1	0.5	-7.4	-25.7	22.7	-2.4
PAMPANGA	120.8	320.6	1030.4	785.2	-38.6	-17.6	2.0	-2.9	-15.4	-26.4	13.9	-7.2
TARLAC	43.4	265.4	1193.5	644.3	-25.6	-11.8	-5.1	2.5	-6.7	-18.2	8.8	-5.5
ZAMBALES	40.9	368.0	1793.9	872.0	-26.3	-14.1	0.1	-7.7	-2.2	-21.6	31.4	5.6
Region 4-A												
BATANGAS	231.0	280.4	856.5	746.4	-34.5	-11.7	13.9	5.8	-11.1	-23.1	17.2	6.3
CAVITE	124.9	242.8	985.7	579.0	-30.6	-18.9	6.3	-0.7	-19.1	-30.5	24.2	5.9
LAGUNA	629.2	386.8	845.0	1066.5	-31.0	-21.3	0.3	2.1	0.1	-34.8	6.8	0.4
QUEZON	827.7	382.7	670.0	1229.3	-26.9	-11.7	14.2	-1.6	6.6	-20.6	6.5	0.9
RIZAL	262.4	241.5	1001.3	821.8	-34.1	-27.8	-1.2	-7.5	-11.5	-39.8	24.8	-0.8
Region 4-B												
OCCIDENTAL MINDORO	159.5	265.9	1091.2	762.6	-29.0	0.5	1.0	-23.5	15.8	-23.8	26.7	-2.4
ORIENTAL MINDORO	260.3	269.3	894.3	791.2	-20.6	7.3	17.5	-3.2	21.6	-11.5	5.3	2.9
PALAWAN	101.8	189.3	781.7	640.6	-28.6	6.2	2.8	-2.6	7.3	-9.0	1.0	6.9
NCR												
METRO MANILA	107.5	198.5	1170.2	758.7	-30.7	-26.8	-0.4	-2.6	-17.3	-38.5	21.3	3.7
Region 5												
ALBAY	739.8	386.9	705.8	941.3	-30.8	-14.8	20.4	-3.2	5.7	-18.2	25.3	10.3
CAMARINES NORTE	1029.6	398.5	565.6	1285.7	-29.5	-25.4	9.3	-15.5	5.6	-31.0	8.9	1.5
CAMARINES SUR	666.8	347.4	639.6	1029.4	-34.2	-17.5	17.0	-8.8	4.1	-25.2	16.5	1.9
CATANDUANES	1075.4	512.7	646.3	1199.5	-29.0	-25.4	5.1	-19.7	13.5	-18.7	24.4	8.2
MASBATE	510.2	250.7	569.4	739.3	-25.6	-15.5	21.4	-5.2	11.1	-7.4	42.9	27.9
SORSOGON	958.1	427.9	660.4	973.6	-27.6	-18.9	18.5	-10.6	7.4	-11.4	27.3	16.2

PROVINCES	OBSERVED BASELINE (mm)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	431.2	322.7	862.5	883.7	-31.6	-3.0	-1.9	-8.7	14.9	-13.4	-5.5	11.1
ANTIQUE	297.9	288.0	995.3	841.4	-43.2	0.4	-3.9	-15.1	17.0	-12.6	21.7	11.9
CAPIZ	469.7	342.0	814.2	889.1	-30.5	-2.5	6.8	0.7	17.5	-12.9	-5.3	12.9
ILOILO	324.8	290.6	932.8	828.3	-43.0	-1.6	2.7	0.6	20.4	-13.3	3.8	3.9
NEGROS OCCIDENTAL	234.9	283.0	899.6	784.0	-35.2	-0.6	1.9	-8.7	7.3	-9.3	11.8	14.3
Region 7												
BOHOL	376.1	209.6	412.9	514.5	-49.6	-6.8	5.1	-3.4	21.2	-11.9	18.9	22.6
CEBU	324.0	228.3	595.1	607.4	-31.4	-1.8	11.7	2.9	19.6	0.5	18.9	17.8
NEGROS ORIENTAL	225.8	226.0	639.5	636.9	-44.0	0.3	-1.9	-4.4	17.4	-6.8	20.7	10.5
Region 8												
EASTERN SAMAR	987.0	464.1	559.8	871.4	-27.9	-37.9	21.4	-7.0	1.7	-26.8	2.2	15.8
LEYTE	689.5	342.0	568.7	725.5	-27.2	-26.2	18.9	-9.5	9.4	-18.9	19.6	19.5
NORTHERN SAMAR	1128.9	462.2	566.8	981.4	-34.1	-32.6	17.3	-16.6	-10.7	-20.2	22.1	18.7
SAMAR	889.5	437.0	599.8	879.4	-30.8	-33.1	13.6	-15.2	-11.1	-23.0	20.8	21.1
SOUTHERN LEYTE	818.6	362.2	510.6	695.6	-33.4	-26.0	16.9	1.3	17.1	-16.0	13.0	17.9
Region 9												
ZAMBOANGA DEL NORTE	324.5	279.7	599.1	718.1	-23.7	16.7	5.5	-2.5	2.6	1.7	-0.7	5.4
ZAMBOANGA DEL SUR	294.5	298.7	593.8	663.2	-24.2	17.3	9.6	6.3	3.6	0.0	9.9	7.1
ZAMBOANGA SIBUGAY	284.1	290.5	597.2	674.1	-15.1	18.3	11.0	0.1	4.8	10.3	22.0	8.9
Region 10												
BUKIDNON	329.7	335.6	653.8	559.5	-37.2	-9.6	9.1	11.2	-5.1	-13.0	-9.7	-5.8
LANAO DEL NORTE	337.5	350.3	662.5	621.1	-26.3	-0.6	-0.2	1.5	2.5	-1.9	1.4	7.1
MISAMIS OCCIDENTAL	392.1	323.4	633.1	728.3	-24.4	14.0	6.7	10.3	5.2	0.3	-5.1	4.6
MISAMIS ORIENTAL	442.5	296.0	615.7	581.1	-36.0	-14.0	14.4	2.5	1.8	-17.8	-5.2	-0.1
Region 11												
COMPOSTELA VALLEY	748.1	559.0	546.7	586.6	-32.8	-19.6	14.9	11.4	6.6	-21.9	-6.5	0.0
DAVAO DEL NORTE	637.0	496.5	535.6	556.2	-33.7	-17.3	15.7	14.9	1.1	-22.2	-7.9	-2.2
DAVAO DEL SUR	288.1	347.1	494.1	442.3	-25.0	-12.2	11.7	24.5	15.2	-12.0	-12.6	-4.5
DAVAO ORIENTAL	827.3	611.8	540.4	599.2	-23.2	-14.1	11.6	15.2	15.9	-16.1	-9.9	4.9
Region 12												
NORTH COTABATO	235.4	353.2	572.5	486.0	-24.5	-4.3	7.1	23.6	8.1	-4.5	-8.7	-4.2
SARANGANI	212.3	212.6	333.6	302.5	-23.5	-15.2	-2.7	12.2	15.6	-17.6	-10.4	-5.3
SOUTH COTABATO	183.3	234.1	402.8	351.7	-20.4	-8.6	-3.6	17.0	8.6	-10.8	-18.0	-14.4
SULTAN KUDARAT	189.3	311.0	513.1	448.7	-17.1	-1.1	-1.5	16.1	7.5	-4.2	-13.6	1.3
CARAGA												
AGUSAN DEL NORTE	875.7	441.9	460.0	628.9	-25.7	-23.8	11.8	-18.1	13.8	-36.5	-8.3	0.6
AGUSAN DEL SUR	963.3	586.4	593.4	694.8	-29.6	-21.3	15.0	11.5	-2.9	-26.1	-3.4	-5.9
SURIGAO DEL NORTE	1412.0	639.6	448.0	837.3	-22.5	-31.2	11.5	-9.3	3.2	-33.2	-8.7	9.6
SURIGAO DEL SUR	1394.0	746.9	534.6	842.5	-23.8	-24.2	15.9	7.1	4.0	-29.1	-7.9	-3.7
ARMM												
LANAO DEL SUR	293.8	369.4	661.5	562.2	-27.1	-11.9	1.1	7.1	-1.1	-4.6	-7.4	-3.6
MAGUINDANAO	225.3	399.1	635.3	553.6	-19.5	-0.5	1.1	13.0	5.3	-1.4	-12.6	-1.2

Table 3a: Projected maximum temperature increase (in °C) under high-range and medium-range emission scenarios in 2020 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	30.8	33.3	32.5	32.0	0.9	1.0	0.9	1.0	0.8	1.1	0.5	1.1
ILOCOS SUR	28.0	30.4	29.2	28.9	0.7	0.9	0.8	0.8	0.8	1.2	0.5	1.1
LA UNION	25.8	27.8	26.5	26.3	0.6	0.9	0.7	0.7	0.8	1.2	0.5	1.1
PANGASINAN	30.2	32.6	30.8	30.7	0.7	1.0	0.7	0.9	0.9	1.2	0.8	1.2
CAR												
ABRA	29.4	32.4	31.4	30.7	0.7	1.0	0.9	0.9	0.8	1.1	0.5	1.1
APAYAO	29.5	33.1	32.9	31.4	0.5	1.1	0.8	0.7	0.8	1.1	0.8	0.8
BENGUET	24.6	26.9	25.9	25.4	0.7	1.0	0.7	0.9	0.9	1.2	0.6	1.1
IFUGAO	26.9	31.1	30.4	28.8	0.5	1.0	0.8	0.8	0.9	1.1	0.8	1.0
KALINGA	28.6	33.2	32.4	30.5	0.6	1.1	0.9	0.8	0.8	1.1	0.8	1.0
MOUNTAIN PROVINCE	27.5	31.5	30.7	29.2	0.6	1.0	0.9	0.8	0.9	1.1	0.8	1.0
Region 2												
CAGAYAN	28.6	33.3	33.6	31.1	0.6	1.0	0.8	0.8	0.8	1.1	0.8	0.9
ISABELA	28.2	33.6	33.8	31.1	0.5	1.0	0.8	0.8	0.8	1.1	0.9	0.9
NUEVA VIZCAYA	27.0	30.3	29.8	28.7	0.6	1.1	0.8	0.8	0.9	1.1	0.7	1.1
QUIRINO	28.0	32.1	32.4	30.5	0.6	1.1	0.8	0.8	0.9	1.1	0.9	1.0
Region 3												
AURORA	28.8	32.1	32.6	31.1	0.6	1.0	0.7	0.8	0.9	1.0	1.0	1.1
BATAAN	30.2	33.0	30.9	30.6	0.7	0.9	0.8	1.0	1.0	1.2	0.8	1.2
BULACAN	30.3	33.2	31.3	30.7	0.5	0.9	0.8	0.8	1.0	1.2	0.8	1.1
NUEVA ECIJA	30.4	33.2	31.9	31.3	0.7	1.0	0.8	0.9	1.0	1.2	0.9	1.2
PAMPANGA	30.7	33.3	31.4	30.9	0.6	0.9	0.8	0.9	1.1	1.3	0.9	1.2
TARLAC	31.8	34.1	32.3	32.0	0.7	1.0	0.7	0.9	1.0	1.3	1.0	1.3
ZAMBALES	31.2	33.2	31.2	31.2	0.8	1.0	0.8	1.0	1.0	1.2	0.8	1.2
Region 4-A												
BATANGAS	28.1	31.1	29.9	29.4	0.4	0.8	0.5	0.7	1.1	1.3	0.8	1.0
CAVITE	29.5	32.8	30.7	30.3	0.5	0.8	0.6	0.8	1.2	1.3	0.7	1.1
LAGUNA	29.1	32.5	31.9	30.8	0.4	0.8	0.5	0.6	1.0	1.3	0.9	1.0
QUEZON	28.5	31.5	31.7	30.4	0.5	0.8	0.6	0.5	0.9	1.2	1.0	1.0
RIZAL	29.9	33.1	31.7	30.8	0.4	0.9	0.6	0.6	1.1	1.3	0.8	1.1
Region 4-B												
OCCIDENTAL MINDORO	30.7	32.8	31.0	30.9	0.6	0.8	0.6	0.7	1.0	1.2	0.8	1.0
ORIENTAL MINDORO	30.2	32.5	31.4	31.0	0.6	0.7	0.5	0.4	0.8	1.1	1.1	0.9
PALAWAN	31.3	32.7	31.2	31.5	0.7	0.7	0.7	0.8	0.8	1.2	1.0	0.8
NCR												
METRO MANILA	30.5	33.7	31.6	31.1	0.4	0.8	0.7	0.7	1.1	1.2	0.8	1.1
Region 5												
ALBAY	29.3	31.8	31.9	31.1	0.7	0.8	0.5	0.7	0.9	1.3	0.8	1.0
CAMARINES NORTE	28.6	31.3	32.2	30.8	0.6	0.9	0.5	0.5	0.9	1.2	1.0	0.9
CAMARINES SUR	29.4	32.2	32.2	31.2	0.6	0.8	0.5	0.6	0.9	1.3	0.9	0.9
CATANDUANES	27.8	29.9	30.7	29.9	0.6	0.7	0.5	0.7	0.8	1.1	0.8	0.8
MASBATE	30.2	32.8	32.6	31.8	0.6	0.7	0.5	0.6	0.9	1.4	0.8	0.9
SORSOGON	29.4	31.7	31.9	31.1	0.6	0.7	0.6	0.7	0.8	1.2	0.8	0.8

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	29.3	32.1	31.8	31.0	0.7	0.8	0.6	0.6	1.0	1.3	1.0	0.9
ANTIQUE	30.0	32.6	31.7	31.2	0.7	0.8	0.6	0.8	1.0	1.3	0.8	0.9
CAPIZ	29.4	32.1	32.0	31.2	0.7	0.8	0.6	0.6	1.0	1.3	1.1	0.9
ILOILO	30.2	32.8	31.8	31.4	0.7	0.8	0.5	0.7	1.0	1.4	1.0	1.0
NEGROS OCCIDENTAL	31.2	33.3	31.9	31.8	0.7	0.7	0.5	0.8	0.9	1.3	0.9	0.9
Region 7												
BOHOL	30.5	32.3	32.0	31.6	0.8	0.7	0.6	0.8	0.9	1.3	1.2	1.0
CEBU	30.6	32.5	32.0	31.7	0.7	0.7	0.5	0.7	0.9	1.3	1.0	0.9
NEGROS ORIENTAL	30.6	32.4	31.9	31.6	0.7	0.6	0.5	0.8	0.9	1.3	0.9	0.9
Region 8												
EASTERN SAMAR	29.2	31.3	31.8	31.0	0.6	0.8	0.6	0.6	0.9	1.3	1.1	1.0
LEYTE	30.4	32.3	32.2	31.8	0.8	0.8	0.6	0.8	0.9	1.4	1.1	1.0
NORTHERN SAMAR	29.3	31.6	32.3	31.2	0.6	0.9	0.6	0.7	1.0	1.5	0.8	0.9
SAMAR	29.9	32.1	32.4	31.5	0.7	0.9	0.5	0.7	1.0	1.5	0.9	1.0
SOUTHERN LEYTE	29.8	31.6	31.5	31.2	0.6	0.6	0.6	0.7	0.9	1.3	1.2	1.0
Region 9												
ZAMBOANGA DEL NORTE	30.9	32.3	31.9	31.7	0.9	0.6	0.6	0.8	0.9	1.1	1.1	0.9
ZAMBOANGA DEL SUR	31.0	32.1	31.5	31.4	0.8	0.4	0.5	0.8	0.9	1.0	0.9	0.8
ZAMBOANGA SIBUGAY	31.2	32.3	31.8	31.7	0.9	0.5	0.5	0.9	0.9	1.0	0.9	0.9
Region 10												
BUKIDNON	30.2	32.2	30.7	30.8	0.8	0.9	0.9	0.9	1.0	1.5	1.4	1.1
LANAO DEL NORTE	28.5	30.0	29.6	29.4	0.9	0.7	0.7	0.8	1.0	1.3	1.1	0.9
MISAMIS OCCIDENTAL	29.5	31.1	31.0	30.6	0.7	0.5	0.6	0.7	1.1	1.1	1.2	0.9
MISAMIS ORIENTAL	29.7	31.8	31.4	31.0	0.9	0.9	0.9	0.8	1.0	1.3	1.3	1.0
Region 11												
COMPOSTELA VALLEY	31.0	32.5	32.0	32.2	0.9	0.7	0.8	0.8	1.0	1.4	1.4	1.2
DAVAO DEL NORTE	31.2	32.8	32.0	32.3	1.0	0.8	0.8	0.8	1.0	1.5	1.5	1.2
DAVAO DEL SUR	32.0	33.0	31.5	32.0	0.9	0.7	0.8	0.8	0.9	1.4	1.3	1.1
DAVAO ORIENTAL	30.9	32.1	31.8	32.0	0.9	0.7	0.8	0.7	0.8	1.1	1.2	1.1
Region 12												
NORTH COTABATO	32.1	33.4	32.0	32.1	1.0	0.8	0.9	0.9	0.9	1.6	1.5	1.1
SARANGANI	33.1	33.9	31.9	32.6	0.9	0.7	0.7	0.8	0.8	1.5	1.1	1.1
SOUTH COTABATO	33.2	34.1	32.1	32.7	0.9	0.6	0.8	0.7	0.8	1.4	1.2	1.1
SULTAN KUDARAT	33.3	34.0	32.4	32.7	1.0	0.6	0.8	0.8	0.9	1.4	1.2	1.0
CARAGA												
AGUSAN DEL NORTE	30.5	32.6	32.6	32.1	0.8	0.8	0.8	0.9	1.0	1.5	1.4	1.1
AGUSAN DEL SUR	30.6	32.4	32.1	32.0	0.8	0.7	0.8	0.8	1.0	1.4	1.5	1.2
SURIGAO DEL NORTE	29.9	31.8	32.5	31.9	0.6	0.6	0.7	0.7	1.0	1.2	1.3	1.0
SURIGAO DEL SUR	31.2	32.4	33.2	32.8	0.7	0.6	0.8	0.8	0.9	1.1	1.4	1.2
ARMM												
LANAO DEL SUR	28.7	30.1	29.4	29.2	1.0	0.8	0.8	0.9	0.8	1.3	1.1	1.0
MAGUINDANAO	32.8	33.6	32.3	32.4	1.0	0.6	0.8	0.8	0.9	1.4	1.4	1.1

Table 3b: Projected maximum temperature increase (in °C) under high-range and medium-range emission scenarios in 2050 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	30.8	33.3	32.5	32.0	1.6	1.9	1.6	2.1	2.2	2.4	1.3	2.0
ILOCOS SUR	28.0	30.4	29.2	28.9	1.4	1.8	1.5	1.7	2.0	2.3	1.1	1.9
LA UNION	25.8	27.8	26.5	26.3	1.3	1.8	1.4	1.6	1.9	2.4	1.1	1.8
PANGASINAN	30.2	32.6	30.8	30.7	1.6	1.9	1.6	2.0	2.3	2.3	1.5	2.2
CAR												
ABRA	29.4	32.4	31.4	30.7	1.4	1.9	1.5	1.9	2.1	2.3	1.2	2.0
APAYAO	29.5	33.1	32.9	31.4	1.2	2.4	1.9	2.0	2.1	2.6	1.7	2.0
BENGUET	24.6	26.9	25.9	25.4	1.5	2.0	1.6	1.9	2.0	2.4	1.3	2.0
IFUGAO	26.9	31.1	30.4	28.8	1.2	2.2	2.0	1.9	2.1	2.5	1.8	2.2
KALINGA	28.6	33.2	32.4	30.5	1.4	2.4	2.0	2.1	2.1	2.6	1.8	2.2
MOUNTAIN PROVINCE	27.5	31.5	30.7	29.2	1.4	2.3	2.0	2.0	2.1	2.6	1.8	2.2
Region 2												
CAGAYAN	28.6	33.3	33.6	31.1	1.4	2.3	1.8	2.1	2.1	2.6	1.9	2.1
ISABELA	28.2	33.6	33.8	31.1	1.4	2.2	1.9	2.1	2.1	2.6	2.2	2.3
NUEVA VIZCAYA	27.0	30.3	29.8	28.7	1.4	2.1	1.9	1.9	2.1	2.5	1.5	2.2
QUIRINO	28.0	32.1	32.4	30.5	1.5	2.1	1.9	2.0	2.1	2.6	1.9	2.4
Region 3												
AURORA	28.8	32.1	32.6	31.1	1.4	1.7	1.8	1.7	1.9	2.1	1.9	2.3
BATAAN	30.2	33.0	30.9	30.6	1.6	1.7	1.7	2.2	2.2	2.2	1.5	2.2
BULACAN	30.3	33.2	31.3	30.7	1.3	1.8	1.7	1.7	2.0	2.3	1.5	2.1
NUEVA ECIJA	30.4	33.2	31.9	31.3	1.5	1.8	1.8	1.9	2.1	2.3	1.5	2.3
PAMPANGA	30.7	33.3	31.4	30.9	1.4	1.8	1.8	1.9	2.2	2.4	1.5	2.3
TARLAC	31.8	34.1	32.3	32.0	1.6	1.9	1.7	1.9	2.4	2.4	1.7	2.3
ZAMBALES	31.2	33.2	31.2	31.2	1.7	1.8	1.6	2.1	2.3	2.3	1.5	2.1
Region 4-A												
BATANGAS	28.1	31.1	29.9	29.4	1.4	1.8	1.5	1.8	2.1	2.4	1.6	2.0
CAVITE	29.5	32.8	30.7	30.3	1.4	1.8	1.5	1.9	2.3	2.3	1.5	2.1
LAGUNA	29.1	32.5	31.9	30.8	1.3	1.8	1.7	1.6	2.0	2.4	1.7	2.0
QUEZON	28.5	31.5	31.7	30.4	1.5	1.9	1.7	1.6	1.9	2.4	1.8	2.0
RIZAL	29.9	33.1	31.7	30.8	1.3	1.8	1.6	1.7	2.1	2.4	1.5	2.1
Region 4-B												
OCCIDENTAL MINDORO	30.7	32.8	31.0	30.9	1.6	1.6	1.7	1.8	2.0	2.2	1.6	2.0
ORIENTAL MINDORO	30.2	32.5	31.4	31.0	1.5	1.7	1.6	1.3	1.9	2.1	2.0	1.9
PALAWAN	31.3	32.7	31.2	31.5	1.7	1.5	1.6	1.7	2.0	2.2	1.9	1.8
NCR												
METRO MANILA	30.5	33.7	31.6	31.1	1.3	1.8	1.7	1.8	2.1	2.3	1.5	2.1
Region 5												
ALBAY	29.3	31.8	31.9	31.1	1.7	2.0	1.4	1.6	2.0	2.5	1.7	1.8
CAMARINES NORTE	28.6	31.3	32.2	30.8	1.6	2.2	1.6	1.7	1.9	2.5	2.0	1.9
CAMARINES SUR	29.4	32.2	32.2	31.2	1.7	2.1	1.5	1.7	2.0	2.5	1.8	1.9
CATANDUANES	27.8	29.9	30.7	29.9	1.5	1.8	1.5	1.6	1.7	2.2	1.6	1.7
MASBATE	30.2	32.8	32.6	31.8	1.6	2.0	1.5	1.7	1.9	2.6	1.8	1.6
SORSOGON	29.4	31.7	31.9	31.1	1.6	1.8	1.5	1.7	1.8	2.4	1.6	1.6

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 6												
AKLAN	29.3	32.1	31.8	31.0	1.8	2.1	1.7	1.7	2.0	2.6	2.1	1.7
ANTIQUE	30.0	32.6	31.7	31.2	1.9	1.8	1.7	1.9	2.0	2.4	1.6	1.9
CAPIZ	29.4	32.1	32.0	31.2	1.7	1.9	1.5	1.5	2.0	2.5	2.2	1.8
ILOILO	30.2	32.8	31.8	31.4	1.7	1.8	1.6	1.5	2.1	2.6	2.0	2.0
NEGROS OCCIDENTAL	31.2	33.3	31.9	31.8	1.8	1.8	1.5	1.8	2.1	2.5	1.8	1.8
Region 7												
BOHOL	30.5	32.3	32.0	31.6	1.8	1.9	1.6	1.6	2.0	2.6	2.2	1.8
CEBU	30.6	32.5	32.0	31.7	1.7	2.0	1.6	1.6	2.0	2.5	2.0	1.7
NEGROS ORIENTAL	30.6	32.4	31.9	31.6	1.8	1.7	1.5	1.8	2.0	2.4	1.7	1.8
Region 8												
EASTERN SAMAR	29.2	31.3	31.8	31.0	1.5	2.1	1.7	1.5	1.9	2.6	2.1	1.8
LEYTE	30.4	32.3	32.2	31.8	1.8	2.0	1.6	1.6	2.1	2.8	2.1	1.9
NORTHERN SAMAR	29.3	31.6	32.3	31.2	1.7	2.5	1.6	1.8	2.1	3.0	1.8	1.7
SAMAR	29.9	32.1	32.4	31.5	1.8	2.2	1.6	1.7	2.1	3.0	1.9	1.8
SOUTHERN LEYTE	29.8	31.6	31.5	31.2	1.5	1.7	1.7	1.5	1.9	2.4	2.2	1.9
Region 9												
ZAMBOANGA DEL NORTE	30.9	32.3	31.9	31.7	2.0	1.4	1.5	1.8	2.2	2.1	2.1	1.9
ZAMBOANGA DEL SUR	31.0	32.1	31.5	31.4	1.8	1.2	1.4	1.7	2.1	2.1	1.8	1.9
ZAMBOANGA SIBUGAY	31.2	32.3	31.8	31.7	2.0	1.1	1.4	1.7	2.1	1.9	1.8	1.9
Region 10												
BUKIDNON	30.2	32.2	30.7	30.8	1.9	2.1	1.7	1.7	2.3	2.9	2.9	2.3
LANAO DEL NORTE	28.5	30.0	29.6	29.4	1.9	1.9	1.7	1.6	2.2	2.6	2.2	1.9
MISAMIS OCCIDENTAL	29.5	31.1	31.0	30.6	1.6	1.6	1.5	1.4	2.2	2.4	2.3	1.9
MISAMIS ORIENTAL	29.7	31.8	31.4	31.0	1.6	2.3	1.6	1.4	2.1	2.7	2.7	2.0
Region 11												
COMPOSTELA VALLEY	22.4	23.1	23.1	23.0	1.8	1.9	1.5	1.5	2.1	2.9	2.9	2.3
DAVAO DEL NORTE	31.2	32.8	32.0	32.3	2.1	2.2	1.6	1.5	2.4	3.2	3.2	2.4
DAVAO DEL SUR	32.0	33.0	31.5	32.0	1.9	1.8	1.6	1.5	2.1	2.7	2.7	2.2
DAVAO ORIENTAL	30.9	32.1	31.8	32.0	1.9	1.7	1.2	1.2	1.9	2.3	2.6	2.1
Region 12												
NORTH COTABATO	32.1	33.4	32.0	32.1	2.1	2.1	1.9	1.9	2.3	3.0	2.9	2.3
SARANGANI	33.1	33.9	31.9	32.6	1.8	2.0	1.5	1.5	2.0	2.9	2.3	2.1
SOUTH COTABATO	33.2	34.1	32.1	32.7	1.9	1.8	1.6	1.5	2.1	2.7	2.6	2.2
SULTAN KUDARAT	33.3	34.0	32.4	32.7	2.0	1.8	1.7	1.7	2.2	2.8	2.6	2.2
CARAGA												
AGUSAN DEL NORTE	30.5	32.6	32.6	32.1	1.6	2.1	1.6	1.6	2.1	2.9	2.8	2.2
AGUSAN DEL SUR	30.6	32.4	32.1	32.0	1.7	2.0	1.4	1.4	2.2	2.9	3.1	2.4
SURIGAO DEL NORTE	29.9	31.8	32.5	31.9	1.3	1.8	1.6	1.4	1.8	2.4	2.6	2.1
SURIGAO DEL SUR	31.2	32.4	33.2	32.8	1.6	1.8	1.5	1.3	1.8	2.4	2.9	2.2
ARMM												
LANAO DEL SUR	28.7	30.1	29.4	29.2	2.0	1.9	1.7	1.7	2.0	2.6	2.2	2.0
MAGUINDANAO	32.8	33.6	32.3	32.4	2.1	1.8	1.8	1.7	2.2	2.8	2.8	2.2

Table 3c: Projected maximum temperature increase (in °C) under low-range emission scenarios in 2020 based on 1990-2000 normal values

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 1				
ILOCOS NORTE	0.3	0.9	0.8	1.1
ILOCOS SUR	0.3	0.6	0.7	0.7
LA UNION	0.3	0.6	0.7	0.5
PANGASINAN	0.3	0.4	0.7	0.7
CAR				
ABRA	0.2	0.7	0.8	1.0
APAYAO	0.1	0.7	0.9	0.6
BENGUET	0.2	0.5	0.6	0.7
IFUGAO	0.0	0.6	0.8	0.5
KALINGA	0.1	0.7	0.9	0.7
MOUNTAIN PROVINCE	0.1	0.6	0.9	0.6
Region 2				
CAGAYAN	0.3	0.7	1.0	0.6
ISABELA	0.2	0.6	1.1	0.6
NUEVA VIZCAYA	0.1	0.5	0.7	0.7
QUIRINO	0.1	0.6	0.9	0.6
Region 3				
AURORA	0.2	0.5	0.8	0.5
BATAAN	0.2	0.3	0.5	0.8
BULACAN	0.1	0.4	0.7	0.7
NUEVA ECIJA	0.2	0.4	0.7	0.7
PAMPANGA	0.1	0.3	0.6	0.7
TARLAC	0.3	0.4	0.7	0.7
ZAMBALES	0.3	0.4	0.6	0.8
Region 4-A				
BATANGAS	0.4	0.4	0.8	0.7
CAVITE	0.3	0.4	0.8	0.8
LAGUNA	0.4	0.4	1.0	0.7
QUEZON	0.4	0.4	0.7	0.5
RIZAL	0.3	0.4	1.0	0.9
Region 4-B				
OCCIDENTAL MINDORO	0.2	0.3	0.5	0.6
ORIENTAL MINDORO	0.2	0.3	0.5	0.4
PALAWAN	0.4	0.5	0.2	0.6
NCR				
METRO MANILA	0.2	0.4	0.9	0.9
Region 5				
ALBAY	0.6	0.6	0.6	0.5
CAMARINES NORTE	0.4	0.5	0.7	0.5
CAMARINES SUR	0.5	0.5	0.6	0.5
CATANDUANES	0.3	0.5	0.7	0.5
MASBATE	0.5	0.5	0.5	0.6
SORSOGON	0.5	0.5	0.6	0.6

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 6				
AKLAN	0.3	0.5	0.3	0.5
ANTIQUE	0.4	0.5	0.3	0.5
CAPIZ	0.3	0.4	0.0	0.5
ILOILO	0.4	0.4	0.1	0.6
NEGROS OCCIDENTAL	0.5	0.5	0.3	0.7
Region 7				
BOHOL	0.6	0.4	0.3	0.7
CEBU	0.5	0.4	0.2	0.7
NEGROS ORIENTAL	0.6	0.5	0.3	0.8
Region 8				
EASTERN SAMAR	0.5	0.6	0.5	0.7
LEYTE	0.6	0.4	0.3	0.7
NORTHERN SAMAR	0.5	0.7	0.6	0.7
SAMAR	0.7	0.6	0.6	0.8
SOUTHERN LEYTE	0.5	0.5	0.3	0.7
Region 9				
ZAMBOANGA DEL NORTE	0.5	0.5	0.3	0.6
ZAMBOANGA DEL SUR	0.5	0.4	0.3	0.5
ZAMBOANGA SIBUGAY	0.7	0.5	0.3	0.6
Region 10				
BUKIDNON	0.3	0.6	0.3	0.6
LANAO DEL NORTE	0.2	0.4	0.3	0.4
MISAMIS OCCIDENTAL	0.2	0.4	0.2	0.6
MISAMIS ORIENTAL	0.2	0.3	0.0	0.5
Region 11				
COMPOSTELA VALLEY	0.3	0.4	0.0	0.4
DAVAO DEL NORTE	0.4	0.5	0.0	0.5
DAVAO DEL SUR	0.3	0.6	0.3	0.4
DAVAO ORIENTAL	0.5	0.4	0.0	0.3
Region 12				
NORTH COTABATO	0.4	0.8	0.5	0.5
SARANGANI	0.3	0.8	0.4	0.3
SOUTH COTABATO	0.3	0.7	0.4	0.4
SULTAN KUDARAT	0.4	0.7	0.5	0.4
CARAGA				
AGUSAN DEL NORTE	0.3	0.4	0.0	0.5
AGUSAN DEL SUR	0.2	0.4	-0.2	0.6
SURIGAO DEL NORTE	0.2	0.5	0.2	0.6
SURIGAO DEL SUR	0.3	0.5	-0.1	0.6
ARMM				
LANAO DEL SUR	0.3	0.4	0.3	0.5
MAGUINDANAO	0.4	0.7	0.6	0.4

Table 3d: Projected maximum temperature increase (in °C) under low-range emission scenarios in 2050 based on 1990-2000 normal values

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 1				
ILOCOS NORTE	1.2	1.6	1.6	1.8
ILOCOS SUR	1.2	1.2	1.4	1.4
LA UNION	1.1	1.2	1.4	1.2
PANGASINAN	1.3	1.3	1.6	1.6
CAR				
ABRA	1.1	1.4	1.6	1.6
APAYAO	1.0	1.7	1.9	1.6
BENGUET	1.1	1.4	1.5	1.4
IFUGAO	0.9	1.4	1.8	1.4
KALINGA	0.9	1.6	1.9	1.5
MOUNTAIN PROVINCE	0.9	1.5	1.8	1.5
Region 2				
CAGAYAN	1.1	1.6	1.9	1.6
ISABELA	1.0	1.4	2.0	1.7
NUEVA VIZCAYA	1.0	1.4	1.8	1.6
QUIRINO	1.0	1.4	1.9	1.6
Region 3				
AURORA	1.0	1.2	1.7	1.3
BATAAN	1.1	1.2	1.5	1.6
BULACAN	1.0	1.2	1.8	1.6
NUEVA ECIJA	1.1	1.2	1.8	1.6
PAMPANGA	1.0	1.2	1.6	1.5
TARLAC	1.3	1.3	1.5	1.5
ZAMBALES	1.3	1.3	1.5	1.6
Region 4-A				
BATANGAS	1.2	1.2	1.5	1.5
CAVITE	1.1	1.2	1.6	1.5
LAGUNA	1.0	1.1	1.8	1.4
QUEZON	1.1	1.2	1.5	1.3
RIZAL	1.0	1.2	1.8	1.6
Region 4-B				
OCCIDENTAL MINDORO	1.1	1.1	1.4	1.4
ORIENTAL MINDORO	1.0	1.1	1.2	1.1
PALAWAN	1.3	1.1	1.2	1.3
NCR				
METRO MANILA	1.0	1.1	1.8	1.7
Region 5				
ALBAY	1.3	1.4	1.4	1.3
CAMARINES NORTE	1.1	1.3	1.5	1.2
CAMARINES SUR	1.2	1.3	1.4	1.3
CATANDUANES	1.1	1.3	1.5	1.3
MASBATE	1.3	1.2	1.2	1.2
SORSOGON	1.2	1.2	1.4	1.3

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 6				
AKLAN	1.1	1.1	1.1	1.2
ANTIQUE	1.2	1.2	1.2	1.3
CAPIZ	1.2	1.1	0.8	1.2
ILOILO	1.2	1.1	1.0	1.2
NEGROS OCCIDENTAL	1.3	1.2	1.3	1.5
Region 7				
BOHOL	1.5	1.2	1.2	1.5
CEBU	1.3	1.2	1.2	1.4
NEGROS ORIENTAL	1.5	1.2	1.3	1.6
Region 8				
EASTERN SAMAR	1.3	1.2	1.4	1.4
LEYTE	1.5	1.3	1.2	1.5
NORTHERN SAMAR	1.3	1.3	1.4	1.4
SAMAR	1.4	1.3	1.4	1.5
SOUTHERN LEYTE	1.3	1.2	1.3	1.4
Region 9				
ZAMBOANGA DEL NORTE	1.5	1.1	1.1	1.5
ZAMBOANGA DEL SUR	1.4	1.1	1.1	1.4
ZAMBOANGA SIBUGAY	1.6	1.1	1.1	1.5
Region 10				
BUKIDNON	1.3	1.3	1.0	1.4
LANAO DEL NORTE	1.2	1.2	1.1	1.2
MISAMIS OCCIDENTAL	1.2	1.0	1.0	1.3
MISAMIS ORIENTAL	1.2	1.0	0.7	1.2
Region 11				
COMPOSTELA VALLEY	1.3	1.1	0.8	1.2
DAVAO DEL NORTE	1.5	1.2	0.8	1.3
DAVAO DEL SUR	1.3	1.2	1.0	1.2
DAVAO ORIENTAL	1.4	1.1	0.7	1.1
Region 12				
NORTH COTABATO	1.5	1.6	1.4	1.4
SARANGANI	1.2	1.4	1.2	1.1
SOUTH COTABATO	1.3	1.4	1.1	1.1
SULTAN KUDARAT	1.4	1.5	1.2	1.2
CARAGA				
AGUSAN DEL NORTE	1.3	1.2	1.0	1.4
AGUSAN DEL SUR	1.2	1.1	0.7	1.3
SURIGAO DEL NORTE	1.0	1.2	1.1	1.3
SURIGAO DEL SUR	1.2	1.1	0.7	1.3
ARMM				
LANAO DEL SUR	1.3	1.2	1.0	1.2
MAGUINDANAO	1.4	1.5	1.3	1.2



Table 4a: Projected minimum temperature increase (in °C) under high-range and medium-range emission scenarios in 2020 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	19.9	22.8	24.0	22.9	0.8	0.9	0.9	0.9	0.8	1.1	1.0	0.9
ILOCOS SUR	18.1	20.9	21.5	20.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	0.9
LA UNION	15.1	18.0	19.2	18.1	0.8	0.8	0.8	0.9	1.1	1.0	0.9	0.9
PANGASINAN	19.8	22.3	22.9	22.2	0.8	0.9	0.9	0.9	1.1	1.1	1.1	1.0
CAR												
ABRA	19.4	22.3	23.1	22.1	0.7	0.8	0.8	0.8	0.9	1.0	1.0	0.9
APAYAO	20.0	22.8	24.0	22.8	0.5	0.7	0.8	0.7	0.8	0.9	1.0	0.8
BENGUET	14.2	16.8	18.2	17.0	0.7	0.8	0.8	0.8	1.0	0.9	0.9	0.9
IFUGAO	17.4	20.1	21.3	20.1	0.6	0.7	0.9	0.7	0.9	0.8	1.1	0.8
KALINGA	19.0	21.8	22.9	21.7	0.5	0.7	0.8	0.7	0.9	0.8	1.0	0.8
MOUNTAIN PROVINCE	17.8	20.6	21.7	20.5	0.6	0.7	0.8	0.8	0.9	0.8	1.1	0.8
Region 2												
CAGAYAN	20.4	22.9	24.1	23.0	0.6	0.8	0.9	0.7	0.9	1.0	1.0	0.8
ISABELA	19.9	22.2	23.6	22.5	0.6	0.7	0.9	0.7	0.9	1.0	1.1	0.8
NUEVA VIZCAYA	17.6	19.9	21.1	20.0	0.6	0.7	0.8	0.8	0.9	0.9	1.0	0.9
QUIRINO	19.4	21.5	22.8	21.7	0.6	0.7	0.9	0.8	0.9	1.0	1.1	0.9
Region 3												
AURORA	20.2	22.0	23.2	22.3	0.6	0.7	0.9	0.8	0.9	0.9	1.1	0.9
BATAAN	22.5	24.2	24.4	24.0	0.7	0.9	0.7	0.8	1.0	1.1	1.0	1.0
BULACAN	20.9	22.5	23.0	22.6	0.7	0.8	0.8	0.8	0.9	1.0	1.0	1.0
NUEVA ECIJA	20.3	22.2	23.0	22.2	0.7	0.8	0.8	0.8	0.9	1.0	1.0	1.0
PAMPANGA	21.5	23.3	23.7	23.2	0.7	0.9	0.9	0.8	1.0	1.1	1.0	1.0
TARLAC	20.4	22.6	23.3	22.5	0.7	0.8	0.9	0.9	1.1	1.1	1.1	1.0
ZAMBALES	21.4	23.4	23.6	23.3	0.7	0.8	0.8	0.8	1.0	1.0	1.0	1.0
Region 4-A												
BATANGAS	20.4	21.9	22.0	21.8	0.6	0.8	0.8	0.7	0.9	1.1	1.1	1.0
CAVITE	21.9	23.5	23.8	23.4	0.6	0.8	0.8	0.7	1.0	1.1	1.1	1.0
LAGUNA	21.0	22.6	23.1	22.6	0.6	0.8	0.8	0.7	0.9	1.1	1.2	1.0
QUEZON	21.7	23.0	23.4	23.0	0.6	0.7	0.8	0.7	0.8	1.0	1.1	0.9
RIZAL	21.0	22.7	23.4	22.8	0.7	0.8	0.8	0.7	0.8	1.0	1.1	1.0
Region 4-B												
OCCIDENTAL MINDORO	22.4	23.8	23.6	23.4	0.7	0.8	0.8	0.8	0.9	1.1	1.0	1.0
ORIENTAL MINDORO	22.6	24.1	23.9	23.7	0.7	0.8	0.8	0.7	0.8	1.0	1.2	1.0
PALAWAN	22.5	23.6	23.4	23.3	0.8	0.8	0.8	0.8	0.9	1.1	1.1	1.0
NCR												
METRO MANILA	21.6	23.8	24.3	23.6	0.7	0.9	0.9	0.8	0.9	1.1	1.1	1.0
Region 5												
ALBAY	21.9	22.8	23.7	23.0	0.6	0.7	0.8	0.7	0.9	1.1	1.1	0.9
CAMARINES NORTE	22.7	23.8	24.3	23.8	0.7	0.8	0.8	0.7	0.8	1.1	1.1	0.9
CAMARINES SUR	21.7	22.8	23.9	23.2	0.6	0.7	0.8	0.7	0.9	1.1	1.1	0.9
CATANDUANES	21.6	22.7	23.6	23.0	0.7	0.6	0.8	0.7	0.7	0.9	1.2	0.8
MASBATE	22.9	24.1	24.6	24.1	0.7	0.8	0.8	0.7	0.9	1.2	1.2	1.0
SORSOGON	22.4	23.3	24.0	23.5	0.7	0.7	0.7	0.7	0.7	1.0	1.1	0.9

Region 6												
AKLAN	22.9	23.8	23.9	23.7	0.7	0.8	0.8	0.8	0.9	1.2	1.1	1.0
ANTIQUE	23.2	24.2	24.2	24.1	0.7	0.8	0.8	0.8	1.0	1.1	1.1	1.0
CAPIZ	22.5	23.3	23.5	23.4	0.7	0.9	0.9	0.8	0.9	1.2	1.2	1.0
ILOILO	22.7	23.8	23.9	23.7	0.8	0.9	0.8	0.8	0.9	1.2	1.2	1.0
NEGROS OCCIDENTAL	22.2	23.5	23.7	23.4	0.8	0.8	0.8	0.8	0.9	1.1	1.2	1.1
Region 7												
BOHOL	22.8	23.8	24.3	23.9	0.8	0.8	0.8	0.9	1.0	1.2	1.3	1.1
CEBU	23.1	24.2	24.4	24.1	0.8	0.8	0.8	0.8	0.9	1.2	1.2	1.1
NEGROS ORIENTAL	23.3	24.3	24.1	24.0	0.8	0.8	0.8	0.9	0.9	1.1	1.2	1.1
Region 8												
EASTERN SAMAR	23.1	24.2	24.7	24.3	0.7	0.7	0.8	0.7	0.8	1.0	1.2	1.0
LEYTE	22.5	23.3	23.9	23.5	0.8	0.7	0.8	0.8	0.9	1.1	1.3	1.1
NORTHERN SAMAR	22.7	23.4	24.2	23.8	0.6	0.7	0.8	0.7	0.8	1.0	1.2	1.0
SAMAR	22.7	23.7	24.5	23.9	0.7	0.7	0.8	0.7	0.9	1.0	1.3	1.0
SOUTHERN LEYTE	22.9	23.8	24.0	23.7	0.7	0.6	0.9	0.8	0.8	1.0	1.3	1.1
Region 9												
ZAMBOANGA DEL NORTE	23.1	23.7	23.4	23.2	0.8	0.8	0.9	0.9	1.0	1.1	1.2	1.2
ZAMBOANGA DEL SUR	22.6	23.3	23.1	22.9	0.8	0.7	0.8	0.9	1.0	1.1	1.1	1.1
ZAMBOANGA SIBUGAY	23.0	23.7	23.4	23.2	0.9	0.7	0.8	0.9	1.1	1.1	1.2	1.1
Region 10												
BUKIDNON	20.1	20.9	20.9	20.7	0.8	0.7	0.9	1.0	1.0	1.0	1.1	1.1
LANAO DEL NORTE	20.4	21.1	21.1	20.9	0.8	0.8	0.9	0.8	1.0	1.1	1.1	1.1
MISAMIS OCCIDENTAL	21.8	22.4	22.2	22.1	0.7	0.8	0.9	0.8	0.9	1.1	1.2	1.1
MISAMIS ORIENTAL	21.1	21.9	22.3	22.0	0.8	0.8	1.0	0.9	1.0	1.1	1.3	1.1
Region 11												
COMPOSTELA VALLEY	22.4	23.1	23.1	23.0	0.8	0.7	0.9	0.9	0.9	1.0	1.2	1.2
DAVAO DEL NORTE	22.1	22.7	22.7	22.6	0.7	0.6	0.8	0.8	1.0	1.0	1.1	1.1
DAVAO DEL SUR	21.9	22.6	22.2	22.1	0.8	0.7	0.9	0.9	1.0	1.0	1.1	1.1
DAVAO ORIENTAL	22.7	23.4	23.3	23.2	0.8	0.7	0.9	0.9	0.9	1.1	1.2	1.2
Region 12												
NORTH COTABATO	21.5	22.4	22.1	22.1	0.9	0.8	0.9	1.0	1.1	1.2	1.1	1.1
SARANGANI	22.4	23.1	22.7	22.7	0.9	0.8	0.8	0.9	1.1	1.1	1.1	1.1
SOUTH COTABATO	22.3	23.1	22.7	22.7	0.8	0.8	0.9	1.0	1.1	1.1	1.1	1.2
SULTAN KUDARAT	22.5	23.2	22.9	22.9	0.8	0.8	0.9	0.9	1.1	1.1	1.1	1.1
CARAGA												
AGUSAN DEL NORTE	21.8	22.7	23.1	22.7	0.8	0.7	0.9	0.9	1.0	1.0	1.3	1.2
AGUSAN DEL SUR	21.2	21.9	22.1	21.8	0.7	0.7	0.8	0.9	1.0	1.0	1.1	1.1
SURIGAO DEL NORTE	22.7	23.5	23.8	23.5	0.8	0.7	0.9	0.9	0.8	1.0	1.5	1.2
SURIGAO DEL SUR	21.5	22.3	22.4	22.0	0.7	0.7	0.8	0.8	0.9	1.0	1.1	1.1
ARMM												
LANAO DEL SUR	19.9	20.7	20.6	20.5	0.8	0.8	0.9	0.9	1.1	1.1	1.1	1.1
MAGUINDANAO	22.4	23.1	22.7	22.8	0.9	0.8	0.9	1.0	1.2	1.2	1.2	1.2

Table 4b: Projected minimum temperature increase (in °C) under high-range and medium-range emission scenarios in 2050 based on 1971-2000 normal values

PROVINCES	OBSERVED BASELINE(°C)				HIGH-RANGE EMISSION SCENARIO				MEDIUM-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Region 1												
ILOCOS NORTE	19.9	22.8	24.0	22.9	1.8	1.9	1.8	2.0	2.2	2.3	2.1	1.8
ILOCOS SUR	18.1	20.9	21.5	20.7	1.7	1.8	1.8	2.0	2.1	2.1	2.1	1.9
LA UNION	15.1	18.0	19.2	18.1	1.8	1.9	1.7	2.1	2.2	2.1	2.0	1.9
PANGASINAN	19.8	22.3	22.9	22.2	1.9	1.9	1.8	2.1	2.4	2.3	2.2	2.0
CAR												
ABRA	19.4	22.3	23.1	22.1	1.6	1.8	1.8	1.9	2.1	2.1	2.0	1.9
APAYAO	20.0	22.8	24.0	22.8	1.3	1.7	1.7	1.6	1.9	2.0	2.2	1.7
BENGUET	14.2	16.8	18.2	17.0	1.6	1.8	1.8	2.0	2.1	2.1	2.0	1.8
IFUGAO	17.4	20.1	21.3	20.1	1.4	1.7	1.9	1.8	1.9	1.9	2.4	1.8
KALINGA	19.0	21.8	22.9	21.7	1.3	1.7	1.8	1.7	1.9	1.9	2.3	1.8
MOUNTAIN PROVINCE	17.8	20.6	21.7	20.5	1.4	1.7	1.9	1.8	1.9	1.9	2.4	1.8
Region 2												
CAGAYAN	20.4	22.9	24.1	23.0	1.4	1.8	1.9	1.8	2.0	2.1	2.2	1.8
ISABELA	19.9	22.2	23.6	22.5	1.4	1.8	1.9	1.7	1.9	2.0	2.4	1.8
NUEVA VIZCAYA	17.6	19.9	21.1	20.0	1.4	1.8	1.8	1.7	1.9	2.0	2.2	1.8
QUIRINO	19.4	21.5	22.8	21.7	1.4	1.8	1.9	1.7	1.9	2.0	2.3	1.8
Region 3												
AURORA	20.2	22.0	23.2	22.3	1.5	1.7	1.9	1.8	1.9	2.0	2.3	1.9
BATAAN	22.5	24.2	24.4	24.0	1.7	1.9	1.6	1.9	2.0	2.1	1.9	1.9
BULACAN	20.9	22.5	23.0	22.6	1.6	1.8	1.8	1.8	1.9	2.1	2.0	1.9
NUEVA ECIJA	20.3	22.2	23.0	22.2	1.7	1.8	1.8	1.9	2.1	2.1	2.1	1.9
PAMPANGA	21.5	23.3	23.7	23.2	1.7	1.9	1.8	1.9	2.1	2.2	2.1	2.0
TARLAC	20.4	22.6	23.3	22.5	1.8	1.9	1.9	2.0	2.3	2.2	2.3	2.0
ZAMBALES	21.4	23.4	23.6	23.3	1.7	1.8	1.7	2.0	2.1	2.0	1.9	1.9
Region 4-A												
BATANGAS	20.4	21.9	22.0	21.8	1.5	1.9	1.8	1.8	1.9	2.1	2.1	1.9
CAVITE	21.9	23.5	23.8	23.4	1.6	2.0	1.7	1.8	2.0	2.2	2.1	2.0
LAGUNA	21.0	22.6	23.1	22.6	1.5	1.9	1.9	1.7	1.8	2.1	2.3	1.9
QUEZON	21.7	23.0	23.4	23.0	1.4	1.8	1.9	1.7	1.7	2.0	2.2	1.8
RIZAL	21.0	22.7	23.4	22.8	1.5	1.8	1.7	1.7	1.8	2.0	2.1	1.9
Region 4-B												
OCCIDENTAL MINDORO	22.4	23.8	23.6	23.4	1.6	1.9	1.8	1.9	1.9	2.0	2.1	1.9
ORIENTAL MINDORO	22.6	24.1	23.9	23.7	1.5	1.8	1.9	1.7	1.7	2.0	2.4	1.9
PALAWAN	22.5	23.6	23.4	23.3	1.7	1.8	1.7	1.9	1.8	2.0	2.2	1.9
NCR												
METRO MANILA	21.6	23.8	24.3	23.6	1.6	1.9	1.8	1.8	2.0	2.2	2.1	2.0
Region 5												
ALBAY	21.9	22.8	23.7	23.0	1.4	1.8	1.7	1.6	1.7	2.1	2.2	1.8
CAMARINES NORTE	22.7	23.8	24.3	23.8	1.5	2.0	1.9	1.6	1.7	2.1	2.3	1.9
CAMARINES SUR	21.7	22.8	23.9	23.2	1.5	1.9	1.8	1.6	1.7	2.1	2.2	1.8
CATANDUANES	21.6	22.7	23.6	23.0	1.5	1.7	1.8	1.6	1.6	1.9	2.3	1.7
SORSOGON	22.4	23.3	24.0	23.5	1.6	1.8	1.7	1.7	1.5	2.0	2.1	1.6

Region 6												
AKLAN	22.9	23.8	23.9	23.7	1.6	2.0	1.8	1.8	1.8	2.2	2.2	1.9
ANTIQUE	23.2	24.2	24.2	24.1	1.6	1.9	1.7	1.9	1.8	2.1	2.1	1.9
CAPIZ	22.5	23.3	23.5	23.4	1.6	2.1	1.9	1.8	1.8	2.3	2.4	2.0
ILOILO	22.7	23.8	23.9	23.7	1.6	2.1	1.9	1.8	1.8	2.3	2.3	2.0
NEGROS OCCIDENTAL	22.2	23.5	23.7	23.4	1.7	2.0	1.8	1.9	1.8	2.2	2.3	2.0
Region 7												
BOHOL	22.8	23.8	24.3	23.9	1.7	1.9	1.9	2.0	1.8	2.3	2.6	2.1
CEBU	23.1	24.2	24.4	24.1	1.7	2.1	1.8	1.9	1.8	2.4	2.5	2.0
NEGROS ORIENTAL	23.3	24.3	24.1	24.0	1.7	1.9	1.8	2.0	1.8	2.2	2.3	2.0
Region 8												
EASTERN SAMAR	23.1	24.2	24.7	24.3	1.4	1.6	1.8	1.6	1.6	1.9	2.4	1.9
LEYTE	22.5	23.3	23.9	23.5	1.6	1.8	1.9	1.8	1.7	2.1	2.5	2.0
NORTHERN SAMAR	22.7	23.4	24.2	23.8	1.5	1.8	1.8	1.6	1.6	2.0	2.3	1.8
SAMAR	22.7	23.7	24.5	23.9	1.6	1.8	1.8	1.8	1.7	2.0	2.5	1.9
SOUTHERN LEYTE	22.9	23.8	24.0	23.7	1.5	1.7	2.0	1.9	1.6	2.0	2.6	2.0
Region 9												
ZAMBOANGA DEL NORTE	23.1	23.7	23.4	23.2	1.9	1.9	1.9	2.0	1.9	2.2	2.5	2.2
ZAMBOANGA DEL SUR	22.6	23.3	23.1	22.9	1.8	1.8	1.8	1.9	1.9	2.2	2.3	2.0
ZAMBOANGA SIBUGAY	23.0	23.7	23.4	23.2	1.9	1.8	1.8	2.0	2.0	2.2	2.3	2.1
Region 10												
BUKIDNON	20.1	20.9	20.9	20.7	1.7	1.8	2.0	2.0	1.7	2.0	2.3	2.1
LANAO DEL NORTE	20.4	21.1	21.1	20.9	1.7	1.9	1.9	1.9	1.9	2.0	2.2	2.0
MISAMIS OCCIDENTAL	21.8	22.4	22.2	22.1	1.6	1.8	1.8	1.8	1.7	2.0	2.4	2.0
MISAMIS ORIENTAL	21.1	21.9	22.3	22.0	1.7	2.1	2.0	2.0	1.8	2.1	2.7	2.2
Region 11												
COMPOSTELA VALLEY	22.4	23.1	23.1	23.0	1.8	1.7	1.9	1.9	1.8	2.0	2.4	2.1
DAVAO DEL NORTE	22.1	22.7	22.7	22.6	1.6	1.6	1.8	1.8	1.8	1.9	2.3	2.2
DAVAO DEL SUR	21.9	22.6	22.2	22.1	1.7	1.7	1.8	1.9	1.8	2.1	2.3	2.2
DAVAO ORIENTAL	22.7	23.4	23.3	23.2	1.7	1.7	1.9	1.9	1.7	2.1	2.6	2.2
Region 12												
NORTH COTABATO	21.5	22.4	22.1	22.1	2.0	1.8	2.0	2.0	2.0	2.3	2.3	2.2
SARANGANI	22.4	23.1	22.7	22.7	2.0	1.9	1.8	1.9	1.9	2.2	2.3	2.1
SOUTH COTABATO	22.3	23.1	22.7	22.7	1.9	1.8	1.9	2.0	2.0	2.2	2.3	2.2
SULTAN KUDARAT	22.5	23.2	22.9	22.9	1.9	1.9	1.9	2.0	2.0	2.2	2.2	2.1
CARAGA												
AGUSAN DEL NORTE	21.8	22.7	23.1	22.7	1.7	1.8	2.0	1.9	1.8	2.1	2.7	2.2
AGUSAN DEL SUR	21.2	21.9	22.1	21.8	1.6	1.6	1.8	1.8	1.7	1.9	2.3	2.2
SURIGAO DEL NORTE	22.7	23.5	23.8	23.5	1.6	1.8	2.0	1.9	1.6	2.0	3.0	2.3
SURIGAO DEL SUR	21.5	22.3	22.4	22.0	1.5	1.6	1.7	1.7	1.6	1.9	2.3	2.1
ARMM												
LANAO DEL SUR	19.9	20.7	20.6	20.5	1.8	1.9	1.9	2.0	1.9	2.2	2.3	2.0
MAGUINDANAO	22.4	23.1	22.7	22.8	2.0	1.9	2.0	2.1	2.2	2.4	2.5	2.3

Table 4c: Projected minimum temperature increase (in °C) under low-range emission scenarios in 2020 based on 1990-2000 normal values

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 1				
ILOCOS NORTE	0.4	0.6	0.6	0.7
ILOCOS SUR	0.5	0.5	0.6	0.7
LA UNION	0.5	0.5	0.6	0.8
PANGASINAN	0.5	0.5	0.6	0.7
CAR				
ABRA	0.4	0.5	0.7	0.8
APAYAO	0.3	0.4	0.7	0.6
BENGUET	0.4	0.4	0.6	0.7
IFUGAO	0.2	0.4	0.7	0.6
KALINGA	0.2	0.4	0.6	0.6
MOUNTAIN PROVINCE	0.2	0.4	0.6	0.7
Region 2				
CAGAYAN	0.3	0.5	0.7	0.7
ISABELA	0.3	0.5	0.7	0.6
NUEVA VIZCAYA	0.2	0.4	0.6	0.6
QUIRINO	0.2	0.5	0.7	0.6
Region 3				
AURORA	0.3	0.5	0.6	0.6
BATAAN	0.3	0.4	0.5	0.6
BULACAN	0.4	0.5	0.6	0.6
NUEVA ECIJA	0.3	0.5	0.6	0.6
PAMPANGA	0.4	0.5	0.6	0.6
TARLAC	0.4	0.5	0.6	0.7
ZAMBALES	0.4	0.5	0.6	0.6
Region 4-A				
BATANGAS	0.5	0.5	0.6	0.6
CAVITE	0.5	0.5	0.6	0.6
LAGUNA	0.5	0.5	0.6	0.6
QUEZON	0.4	0.5	0.6	0.6
RIZAL	0.4	0.5	0.6	0.6
Region 4-B				
OCCIDENTAL MINDORO	0.5	0.5	0.5	0.5
ORIENTAL MINDORO	0.4	0.5	0.5	0.5
PALAWAN	0.6	0.5	0.5	0.6
NCR				
METRO MANILA	0.5	0.5	0.6	0.6
Region 5				
ALBAY	0.5	0.6	0.5	0.5
CAMARINES NORTE	0.5	0.6	0.6	0.5
CAMARINES SUR	0.5	0.6	0.5	0.5
CATANDUANES	0.7	0.5	0.5	0.5
MASBATE	0.5	0.5	0.5	0.6
SORSOGON	0.7	0.5	0.4	0.5

PROVINCES	LOW-RANGE EMISSION SCENARIO			
	DJF	MAM	JJA	SON
Region 6				
AKLAN	0.5	0.5	0.5	0.5
ANTIQUE	0.5	0.5	0.5	0.6
CAPIZ	0.5	0.6	0.4	0.5
ILOILO	0.6	0.6	0.5	0.5
NEGROS OCCIDENTAL	0.6	0.5	0.5	0.6
Region 7				
BOHOL	0.7	0.5	0.5	0.6
CEBU	0.7	0.5	0.5	0.6
NEGROS ORIENTAL	0.7	0.5	0.5	0.6
Region 8				
EASTERN SAMAR	0.5	0.4	0.5	0.5
LEYTE	0.7	0.5	0.5	0.6
NORTHERN SAMAR	0.6	0.5	0.5	0.5
SAMAR	0.7	0.5	0.5	0.6
SOUTHERN LEYTE	0.6	0.4	0.5	0.6
Region 9				
ZAMBOANGA DEL NORTE	0.7	0.5	0.6	0.6
ZAMBOANGA DEL SUR	0.7	0.5	0.6	0.6
ZAMBOANGA SIBUGAY	0.8	0.5	0.6	0.6
Region 10				
BUKIDNON	0.8	0.5	0.6	0.7
LANAO DEL NORTE	0.7	0.5	0.6	0.6
MISAMIS OCCIDENTAL	0.5	0.5	0.5	0.5
MISAMIS ORIENTAL	0.8	0.4	0.5	0.6
Region 11				
COMPOSTELA VALLEY	0.8	0.5	0.6	0.7
DAVAO DEL NORTE	0.6	0.4	0.6	0.6
DAVAO DEL SUR	0.7	0.4	0.6	0.6
DAVAO ORIENTAL	0.7	0.5	0.6	0.7
Region 12				
NORTH COTABATO	0.8	0.5	0.7	0.6
SARANGANI	0.7	0.5	0.6	0.6
SOUTH COTABATO	0.7	0.5	0.7	0.6
SULTAN KUDARAT	0.7	0.5	0.6	0.6
CARAGA				
AGUSAN DEL NORTE	0.8	0.4	0.5	0.5
AGUSAN DEL SUR	0.7	0.4	0.5	0.6
SURIGAO DEL NORTE	0.7	0.4	0.4	0.4
SURIGAO DEL SUR	0.6	0.4	0.5	0.6
ARMM				
LANAO DEL SUR	0.8	0.5	0.6	0.6
MAGUINDANAO	0.8	0.6	0.7	0.6

Table 4d: Projected minimum temperature increase (in °C) under low-range emission scenarios in 2050 based on 1990-2000 normal values

PROVINCES		LOW-RANGE EMISSION SCENARIO			
		DJF	MAM	JJA	SON
Region 1					
	ILOCOS NORTE	1.5	1.5	1.4	1.7
	ILOCOS SUR	1.5	1.3	1.4	1.8
	LA UNION	1.5	1.3	1.4	1.9
	PANGASINAN	1.5	1.4	1.4	1.8
CAR					
	ABRA	1.4	1.4	1.4	1.7
	APAYAO	1.1	1.2	1.4	1.4
	BENGUET	1.4	1.2	1.4	1.7
	IFUGAO	1.1	1.2	1.4	1.6
	KALINGA	1.1	1.1	1.4	1.5
	MOUNTAIN PROVINCE	1.2	1.2	1.4	1.6
Region 2					
	CAGAYAN	1.2	1.3	1.5	1.5
	ISABELA	1.2	1.2	1.4	1.5
	NUEVA VIZCAYA	1.1	1.2	1.4	1.5
	QUIRINO	1.2	1.2	1.4	1.5
Region 3					
	AURORA	1.2	1.2	1.4	1.4
	BATAAN	1.4	1.3	1.2	1.6
	BULACAN	1.3	1.3	1.4	1.4
	NUEVA ECIJA	1.4	1.3	1.4	1.5
	PAMPANGA	1.4	1.3	1.4	1.5
	TARLAC	1.4	1.3	1.4	1.7
	ZAMBALES	1.4	1.3	1.3	1.6
Region 4-A					
	BATANGAS	1.3	1.3	1.4	1.5
	CAVITE	1.3	1.3	1.4	1.5
	LAGUNA	1.3	1.3	1.4	1.4
	QUEZON	1.2	1.3	1.4	1.4
	RIZAL	1.3	1.3	1.4	1.4
Region 4-B					
	OCCIDENTAL MINDORO	1.4	1.3	1.3	1.5
	ORIENTAL MINDORO	1.2	1.3	1.3	1.3
	PALAWAN	1.4	1.4	1.3	1.5
NCR					
	METRO MANILA	1.4	1.4	1.4	1.5
Region 5					
	ALBAY	1.3	1.3	1.3	1.4
	CAMARINES NORTE	1.3	1.4	1.4	1.4
	CAMARINES SUR	1.3	1.3	1.3	1.4
	CATANDUANES	1.4	1.3	1.4	1.4
	SORSOGON	1.4	1.3	1.2	1.4

PROVINCES		LOW-RANGE EMISSION SCENARIO			
		DJF	MAM	JJA	SON
Region 6					
	AKLAN	1.4	1.4	1.2	1.4
	ANTIQUE	1.4	1.3	1.3	1.4
	CAPIZ	1.3	1.4	1.3	1.4
	ILOILO	1.4	1.4	1.3	1.4
	NEGROS OCCIDENTAL	1.5	1.4	1.3	1.5
Region 7					
	BOHOL	1.6	1.3	1.4	1.6
	CEBU	1.5	1.3	1.3	1.5
	NEGROS ORIENTAL	1.6	1.4	1.4	1.6
Region 8					
	EASTERN SAMAR	1.2	1.2	1.2	1.3
	LEYTE	1.5	1.3	1.3	1.5
	NORTHERN SAMAR	1.3	1.3	1.3	1.3
	SAMAR	1.5	1.3	1.3	1.4
	SOUTHERN LEYTE	1.3	1.2	1.4	1.5
Region 9					
	ZAMBOANGA DEL NORTE	1.6	1.4	1.5	1.6
	ZAMBOANGA DEL SUR	1.6	1.4	1.4	1.5
	ZAMBOANGA SIBUGAY	1.7	1.4	1.4	1.6
Region 10					
	BUKIDNON	1.6	1.3	1.5	1.7
	LANAO DEL NORTE	1.5	1.3	1.4	1.5
	MISAMIS OCCIDENTAL	1.3	1.2	1.3	1.4
	MISAMIS ORIENTAL	1.6	1.3	1.3	1.5
Region 11					
	COMPOSTELA VALLEY	1.6	1.3	1.4	1.6
	DAVAO DEL NORTE	1.4	1.2	1.4	1.5
	DAVAO DEL SUR	1.5	1.2	1.4	1.5
	DAVAO ORIENTAL	1.5	1.3	1.5	1.6
Region 12					
	NORTH COTABATO	1.7	1.3	1.6	1.6
	SARANGANI	1.6	1.4	1.4	1.5
	SOUTH COTABATO	1.6	1.3	1.5	1.6
	SULTAN KUDARAT	1.6	1.4	1.5	1.6
CARAGA					
	AGUSAN DEL NORTE	1.6	1.3	1.4	1.5
	AGUSAN DEL SUR	1.4	1.2	1.4	1.5
	SURIGAO DEL NORTE	1.4	1.3	1.4	1.4
	SURIGAO DEL SUR	1.3	1.1	1.3	1.4
ARMM					
	LANAO DEL SUR	1.6	1.3	1.5	1.6
	MAGUINDANAO	1.7	1.4	1.6	1.6

GLOSSARY

Adaptation - Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Anthropogenic - Derived from human activities.

Baseline/Reference - The baseline (or reference) is any datum against which change is measured. It might be a "current baseline," in which case it represents observable, present-day conditions. It might also be a "future baseline", which a projected future is set of conditions excluding the driving factor of interest (e.g., how would a sector evolve without climate warming).

Climate Change - "change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."

Climate Model - A quantitative way of representing the interactions of the atmosphere, oceans, land surface, and ice. Models can range from relatively simple to quite comprehensive.

Climate Projection - A description of the response of the climate system to emission or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models. Climate projections are subject to uncertainty, because they are typically based on assumptions concerning future socio-economic and technological developments that may or may not be realized.

Climate risk - means a risk resulting from climate change and affecting natural and human systems and regions.

Climate Variability - Climate variability refers to variations in the mean state of the climate and other statistics (such as standard deviations, the occurrence of extremes, etc.) on all temporal and spatial scales beyond that of individual weather events.

Downscaling - is the general name for a procedure to take information known at large scales to make predictions at local scales. It refers to techniques that take output from the model and add information at scales smaller than the grid spacing.

ECHAM4 - ECHAM is a Global Climate Model developed by the Max Planck Institute for Meteorology, one of the research organizations of the Max Planck Society.

Emissions Scenario - Representation of the future development of emissions of greenhouse gases based on a set of assumptions about driving forces and their key relationships.

General Circulation Model (GCM) - A global, three-dimensional computer model of the climate system which can be used to simulate human-induced climate change. GCMs are highly complex and they represent the effects of such factors as reflective and absorptive properties of atmospheric water vapor, greenhouse gas concentrations, clouds, annual and daily solar heating, ocean temperatures and ice boundaries. The most recent GCMs include global representations of the atmosphere, oceans, and land surface.

Greenhouse Gas - Any gas that absorbs infra-red radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), halogenated fluorocarbons (HCFCs), ozone (O_3), per fluorinated carbons (PFCs), and hydro fluorocarbons (HFCs). (EPA)

HadCM3 - **HadCM3** (abbreviation for *Hadley Centre Coupled Model, version 3*) is a coupled atmosphere-ocean general circulation model (AOGCM) developed at the Hadley Centre in the United Kingdom. It was one of the major models used in the IPCC Third Assessment Report in 2001.

Intergovernmental Panel on Climate Change (IPCC) -The IPCC was established jointly by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change.

IPCC SRES Scenarios - Special Reports on Emission scenarios by the IPCC, containing information on possible future climate developments and consequences for society and the environment. Emissions scenarios are a central component of any assessment of climate change.

PAGASA- Philippine Atmospheric, Geophysical and Astronomical Services Administration

PRECIS - (pronounced as in the French **précis** - "PRAY-sea") is based on the Hadley Centre's regional climate modelling system. It has been ported to run on a PC (under Linux) with a simple user interface, so that experiments can easily be set up over any region. PRECIS was developed in order to help generate high-resolution climate change information for as many regions of the world as possible. The intention is to make PRECIS freely available to groups of developing countries in order that they may develop climate change scenarios at national centres of excellence, simultaneously building capacity and drawing on local climatological expertise. These scenarios can be used in impact, vulnerability and adaptation studies, and to aid in the preparation of National Communications, as required under Articles 4.1, 4.8 and 12.1 of the United Nations Framework Convention on Climate Change (UNFCCC).

Projection - The term "projection" is used in two senses in the climate change literature. In general usage, a projection can be regarded as any description of the future and the pathway leading to it. However, a more specific interpretation has been attached to the term "climate projection" by the IPCC when referring to model-derived estimates of future climate.

Risk (climate-related) – is the possibility of interaction of physically defined hazards with the exposed systems. Risk is commonly considered to be the combination of the likelihood of an event and its consequences – i.e., risk equals the probability of climate hazard occurring multiplied the consequences a given system may experience.

Scenario - A scenario is a coherent, internally consistent and plausible description of a possible future state of the world. It is not a forecast; rather, each scenario is one alternative image of how the future can unfold.

SNC - Second National Communication to the United Nation Framework Convention on Climate Change

Emission Storylines - A narrative description of a scenario (or a family of scenarios), highlighting the main scenario characteristics and dynamics, and the relationships between key driving forces.

UK Met Office Hadley Center - The Met Office Hadley Centre is the UK's foremost climate change research centre.

United Nations Framework Convention on Climate Change (UNFCCC) - The UNFCCC arose from increasing international concern about the implications of climate change and recognition that no one country can solve this global environmental problem alone. The ultimate objective of the UNFCCC is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human-induced interference with the climate system.

Vulnerability - is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

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INTERNET

US Environmental Protection Agency (*http://www.epa.gov/climatechange/science*)

IPCC Data Distribution Center (*www.ipcc-data.org)*

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