



GREEN
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Meeting of the Board
12 – 14 November 2019
Songdo, Incheon, Republic of Korea
Provisional agenda item 14

GCF/B.24/02/Add.14

22 October 2019

Consideration of funding proposals - Addendum XIV

Funding proposal package for SAP010

Summary

This addendum contains the following seven parts:

- a) A funding proposal titled “Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines”;
- b) No-objection letter issued by the national designated authority(ies) or focal point(s);
- c) Environmental and social report(s) disclosure;
- d) Secretariat’s assessment;
- e) Independent Technical Advisory Panel’s assessment;
- f) Response from the accredited entity to the independent Technical Advisory Panel’s assessment; and
- g) Gender documentation.

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Simplified Approval Process Funding Proposal

Project/Programme title:	Multi-Hazard Impact-Based Forecasting and Early Warning System (MH-IBF-EWS) for the Philippines
Country:	PHILIPPINES
National Designated Authority(ies):	Climate Change Commission
Accredited Entity:	Land Bank of the Philippines (LANDBANK)
Executing Entity	Department of Science and Technology - Philippine Atmospheric Geophysical and Astronomical Services Administration (DOST-PAGASA)
Co-Executing Entities:	Department of Environment and Natural Resources – Mines and Geosciences Bureau (DENR-MGB), Department of the Interior and Local Government (DILG), Office of Civil Defense (OCD), Tuguegarao City Local Government Unit (LGU), Legazpi City LGU, Palo, Leyte LGU, New Bataan, Davao de Oro LGU, and World Food Programme (WFP)
Date of first submission:	March 5, 2019 (concept note), June 17, 2019 (funding proposal)
Date of current submission/ version number	2019/09/19 version 7
If available, indicate GCF code:	FP Philippines Landbank 21660 SAP [iPMS#21660]



Contents

Section A **PROJECT / PROGRAMME SUMMARY**

This section highlights some of the project's or programme's information for ease of access and concise explanation of the funding proposal.

Section B **PROJECT / PROGRAMME DETAILS**

This section focuses on describing the context of the project/programme, providing details of the project/programme including components, outputs and activities, and implementation arrangements.

Section C **FINANCING INFORMATION**

This section explains the financial instrument(s) and amount of funding requested from the GCF as well as co-financing leveraged for the project/programme. It also includes justification for requesting GCF funding and exit strategy.

Section D **LOGIC FRAMEWORK, AND MONITORING, REPORTING AND EVALUATION**

This section includes the logic framework for the project/programme in accordance with the GCF Results Management Framework and Performance Measurement Framework, and gives an overview of the monitoring, reporting and evaluation arrangements for the proposed project/programme.

Section E **EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA**

This section provides an overview of the expected alignment of the projects/programme with the GCF investment criteria: impact potential, paradigm shift, sustainable development, needs of recipients, country ownership, and efficiency and effectiveness.

Section F **ANNEXES**

This section provides a list of mandatory documents that should be submitted with the funding proposal as well as optional documents and references as deemed necessary to supplement the information provided in the funding proposal.



Note to accredited entities on the use of the SAP funding proposal template

- The Simplified Approval Process Pilot Scheme (SAP) supports projects and programmes with a GCF contribution of up to USD 10 million with minimal to no environmental and social risks. Projects and programmes are eligible for SAP if they are ready for scaling up and have the potential for transformation, promoting a paradigm shift to low-emission and climate-resilient development.
- This template is for the SAP funding proposals and is different from the funding proposal template under the standard project and programme cycle. Distinctive features of the SAP funding proposal template are:
 - *Simpler documents*: key documents have been simplified, and presented in a single, up-front list;
 - *Fewer pages*: A shorter form with significantly fewer pages. The total length of funding proposals should **not exceed 20 pages**;
 - *Easier form-filling*: fewer questions and clearer guidance allows more concise and succinct responses for each sub-section, avoiding duplication of information.
- Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other funding proposal documents such as project appraisal document, pre-feasibility studies, term sheet, legal due diligence report, etc.
- Submitted SAP Pilot Scheme funding proposals will be disclosed simultaneously with submission to the Board, subject to the redaction of any information which may not be disclosed pursuant to the GCF Information Disclosure Policy.

Please submit the completed form to:

fundingproposal@gcfund.org

Please use the following name convention for the file name:

“SAP-FP-[Accredited Entity Short Name]-[yymmdd]”



A. PROJECT/PROGRAMME SUMMARY			
A.1. Has this FP been submitted as a SAP CN before?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
A.2. Is the Environmental and Social Safeguards Category C or I-3?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
A.3. Project or programme	<i>Indicate whether this FP refers to a combination of several projects (programme) or one project.</i> <input checked="" type="checkbox"/> Project <input type="checkbox"/> Programme	A.4. Public or private sector	<input checked="" type="checkbox"/> Public sector <input type="checkbox"/> Private sector
A.5. Result area(s)	<i>Indicate the result areas for the project/programme.</i> <u>Mitigation:</u> Reduced emissions from: <input type="checkbox"/> Energy access and power generation <input type="checkbox"/> Low emission transport <input type="checkbox"/> Buildings, cities and industries and appliances <input type="checkbox"/> Forestry and land use <u>Adaptation:</u> Increased resilience of: <input checked="" type="checkbox"/> Most vulnerable people and communities, including women and girls <input type="checkbox"/> Health and well-being, and food and water security <input type="checkbox"/> Infrastructure and built environment <input type="checkbox"/> Ecosystem and ecosystem services		
A.6. Total investment (GCF + co-finance)	20,191,349.96 (USD)	A.7. Total GCF funding requested	9,999,042.27 (USD)
A.8. Type of financial instrument requested for the GCF funding	<i>Mark all that apply.</i> <input checked="" type="checkbox"/> Grant <input type="checkbox"/> Loan <input type="checkbox"/> Equity <input type="checkbox"/> Guarantees <input type="checkbox"/> Others:		
A.9. Division of GCF funding by thematic funding window (if applicable)	<u>_____ USD or _____ % Mitigation</u> 9,999,042.27 USD or 100 % Adaptation <i>In case of cross-cutting project/programme, indicate the allocation of funding according to mitigation or adaptation activities. The sum of mitigation and adaptation should add to the amount indicated in field A.7.</i>		
A.10. Implementation period	5 years <i>(i.e. From the effective date of the Funded Activity Agreement to the Completion Date)</i>		
A.11. Total project/programme lifespan	10 years	A.12. Expected date of internal approval	7/1/2019
A.13. Executing Entity information	Department of Science and Technology - Philippine Atmospheric Geophysical and Astronomical Services Administration (DOST-PAGASA)		

**A.14. Scalability and potential for transformation (Eligibility for SAP, max. 50 words)**

1. The proposed innovation from the current paradigm of hazard-focused forecasting and early warning to one that is impact-based will transform the existing system of end-to-end early warning in the country and how it is implemented, from the way forecasts and warnings and their content are generated to how these are communicated and disseminated to all end-users and utilized to manage climate risks. A multi-hazard impact-based forecasting and early warning system (MH-IBF-EWS) necessitates DOST-PAGASA, the national hydrometeorological warning service of the Philippines and producer of climate and weather information, to generate climate risk information and weather forecasts using probabilistic methodologies to improve accuracy of weather and climate predictions as well as to be actively involved in better understanding societal impacts of severe weather and climate conditions to make the service they provide more relevant to decision-makers and end-users. Alongside these institutional changes in the first mile is the expansion of the role of end-users, namely, the communities at-risk and local decision-makers, i.e. municipal/city authorities, NGOs, and humanitarian agencies working on the ground. An active, well-defined participation and sustained engagement of last-mile stakeholders are a key ingredient in institutionalizing a people-centered MH-IBF-EWS. This project posits that a people-centered MH-IBF-EWS will bring about more proactive and inclusive climate risk management in the country and contribute to long-term adaptation efforts in the country.
2. The project will scale up current initiatives of DOST-PAGASA on hazard and risk assessment, modelling and mapping using a probabilistic approach. It is acquiring a Cray supercomputer, a high performance computing (HPC) system that can provide the necessary computing resource to run an ensemble prediction system (EPS). The EPS will generate the national probabilistic forecasts. This GCF project will leverage on this capability and DOST-PAGASA's ongoing collaboration with the UK Met Office that aims to advance scientific understanding and modelling capabilities needed for impact-based forecasting and early warning for heavy rainfall, thunderstorm and severe wind using Metro Manila and Metro Cebu as study areas. It will also build on the severe wind risk analysis project and climate-adjusted flood hazard modeling study implemented under the RAPID Program¹ in selected municipalities in the provinces of Samar, Eastern Samar and Leyte. Through this GCF project, probabilistic risk assessment and modeling methodologies and tools for flood, landslide, storm surge and severe wind will be developed and standardized. A national interactive multi-hazard map will be generated for primary hazards, i.e. heavy rainfall and severe wind, for all the provinces in the country. Impact-based forecasts and warnings and risk maps at the provincial level will be generated for severe wind by using readily available census data on population and buildings.
3. Applying probabilistic risk assessment, mapping and forecasting at the local (i.e. municipality/city) level using four project sites will demonstrate the transformative effects of a people-centered MH-IBF-EWS. High-resolution risk maps with corresponding detailed impact tables and response tables will be produced with the active engagement of both the communities at-risk and local decision-makers, particularly in crafting warnings and planning early actions during the "window of anticipation." These local-level activities will scale up initiatives on forecast-based early actions or FbA, which includes forecast-based financing. Past and current initiatives of the World Food Programme (WFP), Oxfam, Philippine Red Cross (PRC), etc. implemented in various parts of the country will be utilized to bring FbA to scale so these can be implemented by other local governments in the country, humanitarian organizations, NGOs, donors, etc. depending on context.

A.15. Project/Programme rationale, objectives and approach (max. 250 words)

4. With the projected increase in the intensity of tropical cyclones² and associated hazards in the Philippines brought about by climate change and variability, the impacts of severe hydro-meteorological events result to increasing casualties, significant damage to property and infrastructure, and adverse socio-economic consequences for people, business and industry that can persist for many years. This climate-related vulnerability of the country was magnified during the 2013 Typhoon Haiyan (local name: Yolanda), which resulted in 6,293 recorded deaths, 28,689 injured, 1,061 missing, and an estimated infrastructure and agriculture damage of USD 760 million.³ Accurate warnings on Yolanda's track and intensity and relatively accurate estimates of storm surge height were issued by DOST-PAGASA. However, the information was not sufficient enough for local governments and the public to understand the potential impacts of the hazards and actions they needed to do to protect themselves and their assets. Lessons from Typhoon Haiyan therefore indicate that although forecasts and warnings may be fairly accurate, the lack of understanding of risk

¹ Resilience and Preparedness Towards Inclusive Development Program (RAPID) is supported by UNDP and Australian Aid.

² Gallo F, Daron J, Macadam I, et al. *High-resolution regional climate model projections of future tropical cyclone activity in the Philippines*. Int J Climatol. 2018;1–14. <https://doi.org/10.1002/joc.5870>

³ NDRRMC Update dated 17 April 2014.



information and its potential impacts remains a challenge. Actionable risk information and warnings and response action are key to the effectiveness and efficiency of EWS. This is the innovative solution that this project proposes to establish by building on lessons, best practices and state-of-the art impact-based multi-hazard early warning system coupled with forecast-based early actions.

5. Moreover, the country is experiencing an increasing trend of damage and losses, for instance, from the impacts of typhoon-induced floods and landslides. Based on the report published by ADB (2018), between 2000 and 2016, these hazardous events caused over 23,000 deaths, affected roughly 125 million people, and about USD 20 billion worth of damage and losses. From these reported damage and losses, 80% of the disasters in the country are caused by hydrometeorological events such as typhoons and floods.⁴ With increasing adverse effects of climate change and variability and the Philippines being particularly vulnerable to these hazards even as exposure continue to rise as more people, infrastructure and assets locate and concentrate in hazardous areas, the government and people must ramp up their coping and adaptation strategies to reduce vulnerability to severe weather events, improve climate risk management, and increase resilience. This calls for improving the current EWS in the Philippines at the national and local levels.
6. Lessons from past disasters such as Typhoon Haiyan, the projected increase in the intensity of tropical cyclones,^{5,6} and increasing societal losses resulting even from well forecast extreme events necessitate an end-to-end early warning system (EWS) that is multi-hazard in view of cascading or simultaneous impacts of tropical cyclones, floods, landslides, and storm surges. Impact-based forecasting and warning will focus on translating hazard information into likely human, physical, environmental, and economic impacts and the corresponding preparedness, early actions and response to mitigate those impacts. By focusing on impacts, disaster management agencies, local government units (LGUs), and the general public will have a better understanding of the risk and will more likely take appropriate action. Although EWS has been integrated in the National Disaster Risk Reduction and Management Plan (NDRRMP) for 2011-2028⁷ and in many local disaster preparedness, response and contingency plans of LGUs, enabling LGUs and national government to institute preventive and preparedness measures to protect lives and properties, the challenge is how national technical agencies such as DOST-PAGASA and DENR-MGB in charge of hydro-meteorological warning and geological technical services, respectively, together with OCD⁸ and DILG,⁹ could provide impact-based forecasts and warnings coordinated by the NDRRMC and take on a more proactive role in climate risk management in the country. Further, impact-based forecasts and risk-informed warnings need to be timely, meaningful and actionable to all end-users, particularly to local decision-makers and communities at-risk. At the local level, hazard forecasts need to be translated into warnings that convey location- and sector-specific impacts, providing tailored climate risk information directly to the LGUs, vulnerable communities, NGOs, humanitarian agencies on the ground and the public. This will improve people's understanding of potential impacts and increase the effectiveness of EWS. The role of last-mile communities, the communities at-risk and local authorities, NGOs and humanitarian agencies on the ground in this kind of EWS is paramount. It requires active participation and sustained engagement of end-users in designing and communicating forecasts and warnings and in planning preparedness measures during normal times and early actions that need to be taken in advance of the event to avoid loss of life and mitigate adverse impacts on livelihoods and properties. A people-centered multi-hazard impact-based forecasting and early warning system will ensure that society's response is commensurate to the risks that threaten communities, government institutions, businesses, and the general public and enable action in advance to reduce the risks involved.
7. This project will address the urgent need for a more proactive and inclusive climate risk management in the Philippines anchored on a people-centered multi-hazard impact-based forecasting and early warning systems (MH-IBF-EWS) for flood, landslide, severe wind and storm surge. A MH-IBF-EWS that is people-centered will increase the availability of, access to, and understanding of impact-based warning, enabling end-users, particularly in the last mile, to reduce their exposure to climate risks, and strengthen their absorptive and adaptive capacities to better manage or adjust to impacts brought about by climate shocks and climate change, and increase capacities to develop long-term climate risk reduction and adaptation measures. To do

⁴ Jha, S., A. Martinez, P. Quising, Z. Ardaniel, and L. Wang. 2018. *Natural Disasters, Public Spending, and Creative Destruction: A Case Study of the Philippines*. ADBI Working Paper 817 (Tokyo: Asian Development Bank Institute). Available: <https://www.adb.org/publications/natural-disasters-public-spending-and-creative-destructionphilippines>

⁵ PAGASA. *Observed Climate Trends and Projected Climate Change in the Philippines*.

⁶ Gallo, *High Resolution Regional Climate Projections of Future Tropical Cyclone Activity in the Philippines*.

⁷ The NDRRMP is currently being updated by OCD, with the first draft of the Updated NDRRMP released for discussion by NDRRMC on 4 July 2019.

⁸ OCD is the executive arm of NDRRMC and national focal agency tasked to coordinate disaster risk reduction and management activities.

⁹ DILG is Vice-Chair for Disaster Preparedness of the NDRRMC.



so, institutional and technical capacities of government authorities to generate climate risk information and accurate and timely impact-based forecasts and warnings need to be enhanced. Enhanced climate risk information will be utilized in development policy-making and planning processes at national and local levels, while MH-IBF-EWS will be mainstreamed in national climate and disaster risk management frameworks and plans and *in local resilience plans*¹⁰, i.e. local disaster risk reduction and management plans and its variants like disaster preparedness plan, emergency response plan, contingency plan, local climate change action plans, and other related local plans. A high level of commitment and closer operational cooperation among DOST-PAGASA, DENR-MGB, OCD, and DILG are essential to develop operational plans and SOPs by each collaborating agency to implement a MH-IBF-EWS. Innovative partnerships will be forged as well to foster collaborative work among stakeholders across levels of government, civil society, academia, and communities at-risk, particularly improving risk and warning information with end-user participation, communication, dissemination and information delivery that supports decision-making and planning by all end-users and improving response capabilities of all end-users to reduce loss of life and assets, mitigate anticipated negative impacts of climate-induced hazards before, during and after extreme weather events, and develop a diverse range of proactive climate risk management and adaptation strategies.

8. In order to achieve these, the project will implement four outputs: i) Generating science-based multi-hazard weather and risk information; ii) Establishing a MH-IBF-EWS supported by a knowledge and decision support system; iii) Improving national and local capacities in implementing a people-centered MH-IBF-EWS and forecast-based early actions (FbA); and iv) Mainstreaming climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalizing a people-centered MH-IBF-EWS in the Philippines.
9. The project has two scopes of implementation. At the national level, probabilistic risk assessment, modeling and mapping methodologies, tools and technologies will be standardized for analyzing, monitoring, and forecasting four hazards, i.e. severe wind, storm surge, flood and landslide. This will provide weather forecasts and warnings and climate risk information usable for climate risk management to support the establishment of a framework on impact-based forecasting and early warning system for the country. Weather forecasts and forecast models, probabilistic hazard and risk information, and a nationwide interactive color-coded multi-hazard maps for heavy rainfall and severe wind for all provinces in the country will be generated on a daily basis. For severe wind, provincial-level probabilistic forecasts, risk maps and accompanying general impact tables and response tables will be generated by using census data on population and buildings. These weather and risk information in text and spatial formats will be accessible via a web-based knowledge and decision support system for MH-IBF-EWS. The knowledge and decision support system will enable access to different types of end-users with varying levels of accessibility.
10. The local scope of implementation will comprise of activities involving the four project sites. Project sites will be used to localize the methodologies, technologies and tools for analyzing, monitoring, and forecasting four hazards, i.e. severe wind, storm surge, flood and landslide and further calibrate them. At this level, impact-based forecasts are possible for the four hazards because of the availability of detailed exposure data, which will be collected through the project. Impact-based forecasts and warnings will be produced in text and spatial formats conveyed in detailed impact tables and response tables and maps. The same knowledge and decision support system for MH-IBF-EWS will be utilized to generate and share these information to various end-users.
11. Together with local authorities, humanitarian agencies, NGOs and vulnerable communities in the project sites, impact-based forecasts will likewise be used to identify priority forecast-based early actions (FbA), which includes forecast-based financing and shock-responsive social protection measures, develop an early action protocol (EAP) for the hazards in each project site, determine the triggers for the hazards in each project site that will activate the EAP, and update and mainstream FbA in local resilience plans and relevant development and sectoral plans. The results of these activities at the project site level will further demonstrate the effectiveness, scalability and transformative effects of MH-IBF-EWS.
12. A nationwide capacity building approach will be used to socialize the MH-IBF-EWS framework among all end-users, e.g. national government agencies, local government units (LGUs), humanitarian agencies, NGOs, colleges and universities, donor community, by using the knowledge and decision support system as a training tool. These capacity building activities will ensure that all stakeholders will become aware of the country's shift from a hazard-based to an impact-based forecasting and warning paradigm. These groups of end-users will also cascade their knowledge and training with the people and communities where they operate. At the project site level, stakeholder groups such as local government officers and personnel who are decision and policy makers and planners, i.e. members of the Local city/municipality/barangay DRRM Councils, members of the



Local Development Councils, civil society organizations, humanitarian and donor agencies which operate in project sites, local media, local business sectors, colleges and educational institutions will be trained on impact-based EWS. All sectors of the society will included in the capacity building program. Capacity building activities will be designed to enhance the understanding of impact-based forecasting and early warning, train end-users on how to use the knowledge and decision support system, and facilitate the utilization of the weather and climate risk information for planning and policy-making of different end-users.

¹⁰ **Local resilience plans** is a catch-all term used in this Funding Proposal to refer to all related plans produced by the LGUs in the Philippines such as Local Disaster Risk Reduction and Management Plan (LDRRMP) and its variants such as disaster preparedness plan, emergency response plan and contingency plan, and Local Climate Change Action Plan (LCCAP).

**B. PROJECT/PROGRAMME DETAILS****B.1. Context and baseline (max. 500 words)**

13.

The Philippines is highly vulnerable to sea level rise, increased frequency of extreme weather events, rising temperatures (please refer to Annex 2a, Figures 1a, 1b & 1c), and extreme rainfall¹¹. In the 2017 Global Climate Risk Index (CRI), the Philippines ranks as 4th among countries most affected in the period 1996-2015. The country has been identified as a natural disaster hot-spot with approximately 50.3% of its total area and 81.3% of its population vulnerable to natural disasters (World Bank, 2008). Among the hazards identified, typhoons and storms (58% of all disasters in the country), related flooding (25%) and landslides (6%) pose the greatest threats. Based on the EM-DAT 2017, tropical cyclones (TCs) have killed a total of 42,458 people in the Philippines from 1970-2017, while floods killed a total of 3,639 people and landslides killed 2,401 people. In the same period, TCs have affected a total of 162,894,610 people while floods and landslides affected 34 million people and 318 thousand people, respectively.

14. The changing climate is expected to exacerbate these adverse impacts due to increasing severity and frequency of hydrometeorological hazards. Over the past 65 years (1951-2015), there has been an increasing trend in annual mean temperature with an increase of 0.68°C.¹² Compared to the more rapid increase in the annual minimum temperature (0.15°C/decade), the annual maximum temperature has increased at a slower rate (0.05°C/decade).¹³ The Philippines also experiences more hot days and fewer cooler nights.¹⁴ Globally, the most recent years of 2015 to 2018 correspond to the four warmest annual temperatures, which is consistent with the country's 10 warmest years occurring over the last decade except in 1998, during the 1997-98 strong El Niño event.¹⁵ Projected temperature increases in 2030's and 2040's is likely to be in the range of 0.49°C–0.99°C and 0.72°C–1.27°C, respectively (assuming the moderate emission scenario, RCP4.5), which may lead to increases in intensity of extreme rainfall and tropical cyclones¹⁶. Increasing trends in annual and seasonal rainfall were observed in many parts of the country, and found to be associated with extreme rainfall events.¹⁷ Seasonal rainfall during December–January–February (DJF) is observed to be wetter while July–August–September (JAS) shows an increasing trend in intensity for maximum 1-day rainfall (RX1day) and maximum 5-day rainfall (RX5day).^{18,19,20} Observed wetter seasons of DJF manifested by continuous heavy rains caused landslides in Panaon Island in 2003 and Guinsaugon in 2006, both in Southern Leyte.^{21,22} The 2012 and 2013 "Habagat" events brought widespread flooding, damaged properties, and loss of lives due to the enhancement of the Southwest monsoon.²³ A 20% increase in extreme rainfall is projected over most parts of the country that would continue in the 2030's and 2040's. Likewise, increasing extreme rainfall events (upper bound) for RX1day and RX5day will continue and become more intense under RCP 4.5 scenarios. Continuous trend on intensity of extreme rainfall events may lead to possibility of widespread flooding and landslide events.

¹¹ Cinco, T. A., de Guzman, R. G., Hilario, F. D., & Wilson, D. M. (2014). Long-term trends and extremes in observed daily precipitation and near surface air temperature in the Philippines for the period 1951–2010. Elsevier, 12-26

¹² DOST-PAGASA (2018) Observed Climate Trends and Projected Climate Change in the Philippines. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines, 36 pp.

¹³ DOST-PAGASA (2018)

¹⁴ Cinco, T., de Guzman, R., Hilario, F., & Wilson, D. (2014). Long-term trends and extremes in observed daily precipitation and near surface air temperature in the Philippine for the period 1951-2010. Elsevier, 12-26

¹⁵ WMO. WMO Statement on the state of the global climate in 2018, Report No. 1233 (World Meteorological Organization, 2019).

¹⁶ DOST-PAGASA (2018).

¹⁷ DOST-PAGASA (2018). Observed Climate Trends and Projected Climate Change in the Philippines. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines, 36 pp.

¹⁸ DOST-PAGASA (2018).

¹⁹ Villafuerte , M., Matsumoto, J., Akasaka, J., Takahashi, H., Kubota, H., & Cinco , T. (2014). Long-term trends and variability of rainfall extremes in the Philippines. Elsevier, 1-13. doi:<http://dx.doi.org/10.1016/j.atmosres.2013.09.021>

²⁰ Villafuerte, M., Matsumoto, J. and Kubota, H. (2015). Changes in extreme rainfall in the Philippines (1911-2010) linked to global mean temperature and ENSO. International Journal of Climatology. 35: 2033-2044. DOI: 10.1002/joc.4105

²¹ S. G. Evans, R. H. Guthrie, N. J. Roberts, N. F. Bishop. The disastrous 17 February 2006 rockslide/debris avalanche on Leyte Island, Philippines: a catastrophic landslide in tropical mountain terrain.

Natural Hazards and Earth System Science, Copernicus Publications on behalf of the European Geosciences Union, 2007, 7 (1), pp.89-101. fffal-00299407f

²² Oh, H.J. & Lee, S. (2011) Landslide susceptibility mapping on Panaon Island, Philippines using a geographic information system. Environ Earth Sci 62: 935. <https://doi.org/10.1007/s12665-010-0579-2>

²³ Bagtasa, G. (2019). 118-year climate and extreme weather events of Metropolitan Manila in the Philippines. International Journal of Climatology. <https://doi.org/10.1002/joc.6267>



15. The observed increase in temperature would also bring warmer sea surface temperature (SST), which is linked to the formation of intense tropical cyclones.²⁴ Tropical cyclones is the most destructive hydro-meteorological hazard that affects the Philippines. Observed trends show a slight decrease in frequency of TCs and an increase in occurrences of strong TCs (exceeding 170kph) consistent with global findings.^{25,26} In the most recent decade (1990-2015), trend on intense tropical cyclones due to increasing SST is on the rise. Typhoon Haiyan, which occurred during the highest recorded SST in the warm pool region of the West Pacific, caused widespread loss of lives and damage to property.^{27,28,29} Extreme TCs (wind speeds exceeding 170kph) are also associated with extreme rainfall events all over the country as evidenced by the rampage of Typhoon Washi (Sendong) in 2011 and Typhoon Bopha (Pablo) in 2012, among others.³⁰ Almost 50% of total annual rainfall in Luzon is attributed to tropical cyclones.^{31,32} Projected slight decrease in TC frequency and increase in strong TCs would most likely continue, consistent with observations. With the projected increase in strong TCs, the potential damage and loss due to floods, rain-induced landslides, and storm surge events would be exacerbated.³³ Strong TCs such as the likes of Typhoon Mangkut (Ompong) in 2018 and Typhoon Tembin (Vinta) in 2017 led to significant number of deaths and amount of damage caused by secondary hazards like flooding, strong winds, and storm surge.^{34,35}
16. With the observed sea level rise (SLR) in the Philippines to be more than twice the global average and the projected 10-20% higher SLR against global averages, destruction brought about by storm surges due to extreme tropical cyclone events will pose greater threats.³⁶ The high rates of sea level rise is a significant factor on the massive storm surge brought by Typhoon Haiyan (2013) which caused enormous devastation.³⁷ A continuous propagation of such climate trends will greatly impact sectors including ecosystems, water resources, agriculture, forests, fisheries, industries, urban and rural settlements, energy, tourism, health, and disaster/emergency management. Please see Annex 2, Section 3 – Observed Trends and Projected Changes for tabulated data, graphs and more details on current climate risks and future climate change.
17. Tropical cyclones accompanied by strong winds, intense rainfall, flooding and storm surge represent the major hydro-meteorological hazards in the Philippines. The climate of the country is strongly affected by rain-bearing (monsoon) winds, which blow from the southwest from May to October and from the northeast from November to February. From January to December, an average of twenty typhoons hit the country, out of which five to seven per year are expected to be destructive. Probably more than temperature change, climate change-induced variability of rainfall is likely to have the greatest impacts in the country. The number of days with heavy rainfall in the latter part of the 20th century appears to be higher than the corresponding occurrence in the early part of the 20th century. Evidence shows that the intensity of extreme rainfall events is changing. Over Luzon, frequent rainfall events of greater than 350 millimeters have been recorded more in the last decade than the 275 millimeters rainfall events of the 1960s and 1970s.³⁸

²⁴ Gallo, F., Daron, J., Macadam, I., Cinco, T., Villafuerte, M., Buonomo, E., Jones, R. (2018). High-resolution regional climate model projections of future tropical cyclone activity in the Philippines. International Journal of Climatology, 1-14

²⁵ Gallo, F., Daron, J., Macadam, I., Cinco, T., Villafuerte, M., Buonomo, E., Jones, R. (2018). High-resolution regional climate model projections of future tropical cyclone activity in the Philippines. International Journal of Climatology, 1-14

²⁶ IPCC. (2013) Climate Change, 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York, NY: Cambridge University Press.

<https://doi.org/10.1017/CBO9781107415324>

²⁷ Comiso, J.C., G.J.P Perez, & L.V. Stock. (2015). Enhanced Pacific Ocean Sea Surface Temperature and Its Relation to Typhoon Haiyan. Journal of Environmental Science and Management, 1-10

²⁸ Cinco, T. A., de Guzman, R. G., Ortiz, A. M. D., Delfino, R. J. P., Lasco, R. D., Hilario, F. D., & Ares, E. D. (2016). Observed trends and impacts of tropical cyclones in the Philippines. International Journal of Climatology, 36(14), 4638-4650

²⁹ Lagmay AMF, Agaton RP, Bahala MAC, Briones JBLT, Cabacaba KMC, Caro CVC, Dasallas LL, Gonzalo LAL, Ladiero CN, Lapidez JP, Mungcal MTF, Puno JVR, Ramos MMAC, Santiago J, Suarez JK, Tablazon JP. 2015. Devastating storm surges of Typhoon Haiyan. Int. J. Disaster Risk Red. 11: 1-12, doi: 10.1016/j.ijdrr.2014. 10.006.

³⁰ Bagtasa, G. (2017) Contribution of Tropical Cyclones to Rainfall in the Philippines, J Climate, 30: 3621-3633, DOI: 10.1175/JCLI-D-16-0150.1

³¹ Cinco, T. A., de Guzman, R. G., Ortiz, A. M. D., Delfino, R. J. P., Lasco, R. D., Hilario, F. D., & Ares, E. D. (2016). Observed trends and impacts of tropical cyclones in the Philippines. International Journal of Climatology, 36(14), 4638-4650

³² Bagtasa, G. (2017) Contribution of Tropical Cyclones to Rainfall in the Philippines, J Climate, 30: 3621-3633, DOI: 10.1175/JCLI-D-16-0150.1

³³ Bagtasa, G. (2017) Contribution of Tropical Cyclones to Rainfall in the Philippines, J Climate, 30: 3621-3633, DOI: 10.1175/JCLI-D-16-0150.1

³⁴ WMO. WMO Statement on the state of the global climate in 2018, Report No. 1233 (World Meteorological Organization, 2019).

³⁵ WMO. WMO Statement on the state of the global climate in 2017, Report No. 1212 (World Meteorological Organization, 2018).

³⁶ Kahana, R., R. Abdon, J. Daron, & Scannell, C. (2016). Projections of mean sea level change for the Philippines. Met Office

³⁷ WMO. WMO Statement on the state of the global climate in 2016, Report No. 1189 (World Meteorological Organization, 2017).

³⁸ Thomas, Albert and Perez. 2013. Climate Related Disasters in Asia and Pacific.



18. The anomalous meteorological-climatological events in 2006 and a subsequent dry spell in 2007 during the rainy season demonstrate the devastating impacts of extreme weather events such as flooding and landslides in the Visayas and Mindanao, and water and power shortages in Luzon.³⁹ The excessive rainfall which characterized the years 2004, 2006, and 2008 resulted in numerous problems, including (i) the artificial damming of rivers, which breached and led to flash-floods, and the depositing of debris and logs (for instance, in Aurora-Quezon in 2004 and Iloilo on Panay Island in 2008); (ii) the remobilization of lahar deposits, resulting in the avulsion of rivers and flashfloods (for example, the 2006 event in Legazpi City and its vicinity due to Typhoon Reming); (iii) excessive flooding, leading to the destruction of communities along riverbanks, as well as fishponds, agricultural lands, and road and bridge arteries, and isolating villages (such as flooding in the Cagayan River Basin, Pampanga-Agno River Basin, Bicol River Basin and the Jalaur River Basin in Iloilo); and (iv) mass wasting, mostly landslides, which caused great destruction (such as the landslides in Masara in Compostela Valley in 2006 and 2008, respectively).⁴⁰ There is a statistically significant relationship between the frequency of intense hydro-meteorological natural disasters, exposure, and climate hazards.
19. Estimates for the period 2001 to 2010 suggest that average rainfall deviation increases by another 8 mm per month (moderate emission scenario) could be associated with an increase in the average frequency of hydro-meteorological disasters in the Philippines by an average of around 0.35 disaster a year, or an additional disaster every three years. If the increase in average rainfall hits 12 mm per month (high emission scenario), an increase of one disaster every two years can be expected.⁴¹
20. The heavy rains associated with a series of four (4) tropical cyclones in November 2004 and early December 2004 triggered flash floods and massive landslides in the provinces of Quezon, Aurora, and Nueva Ecija. The reported casualties including missing persons reached more than 1,700 persons with about 3 million people directly affected while the estimated damages to agriculture, properties, and infrastructures including the dam at General Nakar amounted to about US\$260million. From September until early December 2006, a series of four (4) typhoons battered Luzon and Visayas islands, a record-breaking event in the history of tropical cyclone occurrences in the Philippines. Typhoon Xangsane hit Metro Manila, Typhoon Parma affected Northern Luzon provinces, Typhoon Durian devastated the province of Albay and Camarines Sur, and Typhoon Utor battered Tacloban City, the capital of Leyte province. The total estimated damages from the four typhoons amounted to US\$286.96 million, or almost 94% of the total damages for 2006 estimated to be US\$306.52 million. On 21 June 2008, Typhoon Fengshen brought untold suffering and devastation to millions of Filipinos nationwide. Its onslaught affected 4.7 million persons with 557 casualties, 826 injured and 87 missing. It also caused one of the worst sea disasters in the country with the sinking of a major passenger ferry carrying toxic chemicals. Total damages to private properties, infrastructure and agriculture amounted to US\$293.48 million. On 26 September 2009, Tropical Storm Ketsana brought torrential rains equivalent to one month of rainfall in just 6 hours on the Philippine capital of Manila causing extensive flooding. It affected 4.9 million persons with 464 casualties, and damage to infrastructure and property amounted to US\$234 million.
21. Storm surges created by typhoons have struck the country many times in the past. The storm surge with an estimated height between 2.3 and 5 m that devastated Tacloban City and many parts of the Visayas on November 8, 2013 when typhoon Haiyan made landfall was not a unique phenomenon. According to historical records, for instance in 1897 a storm surge hammered Leyte and Tacloban City, killing as many as 7,000 people.
22. In selecting the project sites, the prevailing and future occurrences of climate change induced hazards as well as vulnerability and other socio-economic characteristics of the sites were considered. Exposure and vulnerability to one or two hydrometeorological hazards is one of the criteria, which refers to the frequency of occurrence of relevant hydrometeorological hazards in the project sites and vulnerability to these hazards. This together with other criteria were applied: (i) Highly exposed and vulnerable to one or two hazards; (ii) Representative of urban and rural geographies of the country; (iii) Presence of functional hazard-based early warning system; (iv) Willingness to be part of the project. Based on this set of criteria, four cities/municipalities have been selected as project sites: (1) Tuguegarao City in Cagayan Province – for severe wind and flood; (2) Legazpi City in Albay Province – for severe wind and flood; (3) Municipality of Palo in Leyte Province – for

³⁹ Yumul. G. et al. 2011. Extreme weather events and related disasters in the Philippines, 2004-2008: A sign of what climate change will mean?

⁴⁰ Yumul. G. et al. (2011)

⁴¹ Thomas, Albert and Perez. 2013. Climate Related Disasters in Asia and Pacific.



severe wind and storm surge; and (4) New Bataan in Davao de Oro Province – for severe wind and landslide. Refer to Annex 2, Figure 10 for the map of project sites and further discussion on the selection criteria.

23. With the adoption of Hyogo Framework for Action for Disaster Risk Reduction (HFA) in 2005, the Philippine Government took steps to shift from a reactive approach focusing on disaster relief and response to that of a proactive approach of disaster preparedness and mitigation. The adoption of Republic Act 10121 in 2010 further spurred the paradigm shift to disaster risk reduction and management at all levels of risk governance, though a huge gap between policy and practice still remains today. One of these is the challenge of setting up an end-to-end EWS that delivers accurate and meaningful warning information in a timely manner to authorities and at-risk communities and enabling them to take action. Evenmore so is the challenge of an EWS that is multi-hazard and impact-based that gives the appropriate space and importance to the role of last-mile communities, especially vulnerable groups including indigenous peoples.
24. At present, DOST-PAGASA still operates under a weather forecast and warning paradigm, issuing warnings based on weather criteria for typhoons, floods, and storm surges. Warnings follow a color-coded scheme for heavy rainfall starting in 2012, but it still provides this information based on hazard-based thresholds and lead-times with standardized message content for Metro Manila and areas covered by Doppler radars only, which are then disseminated to the National Disaster Risk Reduction Management Council (NDRRMC) through the Office of Civil Defense (OCD), media, and LGUs. There have been projects related to forecasting and early warning. However these do not focus on multi-hazard impact-based forecasting. Nonetheless, these existing projects complement this proposed project in terms of baseline analysis, lessons learned from the project's implementation and selection of project sites. Training of personnel is also a concern. Forecasting models are available for certain hazards such as flood and severe wind but constantly need upgrading and thus the need for appropriate government investments, including the procurement of monitoring instruments and equipment. Refer to Annex 2a for details on past and current projects.
25. To further improve its forecasting capabilities, DOST-PAGASA recently signed a bilateral agreement and commercial contracts with New Zealand that will help DOST-PAGASA in the dissemination of flood and weather-related information. The MetraWeather, through the New Zealand Met Service, granted DOST-PAGASA the right to use the license for Weatherscape XT. MetraWeather, the international commercial brand of the Met Service of New Zealand, is a global leader in providing innovative weather information services. The said agreement will also enable production of scheduled weather bulletins for a maximum of six (6) minutes per day per broadcaster to be supplied to PTV4, the Philippine government's official television channel.
26. In terms of early warning system, a more proactive approach is yet to develop in many hazard-prone LGUs. Early warning signages like flood markers are only beginning to be put up in areas where recent disasters have occurred. There are only a few good examples where different stakeholders collaborated in disaster preparedness incorporating locally generated early warning systems. A multi-hazard approach would make it possible to build on existing EWS capacities and infrastructure in progressive LGUs.
27. With the passage of Republic Act 10121, the strategy of community-based disaster risk management (CBDRM) as a model to engage communities in DRR and futher decentralize DRR efforts to the LGUs has been given a boost. Though disaster risk management is a devolved function to LGUs, many LGUs still do not have a functional or viable Local Disaster Risk Reduction and Management Offices (LDRRMOs). Further, the quality and capacities of LDRRMOs in the country are still highly uneven. The job of facilitating stakeholder engagement falls mostly on the LDRRMOs, which themselves need capacity building in the area of EWS and community participation.
28. Much work is needed to integrate the EWS in the local disaster risk reduction and management plans or LDRRMPs (including its variants, e.g. disaster preparedness plan, emergency response plan, contingency plans) and local climate change action plans (LCCAPs), not to mention in sectoral plans such as the Comprehensive Development Plans and annual investment programs. Forecast-based early actions and financing is a relatively new strategy that most LGUs are not familiar with.
29. During strong typhoons, communication facilities break down. Some LGUs do not have an alternative system to communicate warnings to residents and inform when to evacuate in advance of the event. Warnings are still usually received through traditional medial channels such as TV and radio. Private cellular companies have agreements with the government to deliver warning text blasts to mobile phones as alerts broadcast by cellular towers within risk areas. Information delivered on mobile phones contribute to a multi-source delivery system, building on more traditional sources such as television and radio broadcasts. Increasingly being used is the Internet, particularly social media such as Facebook and Twitter. However, for remote villages living in the

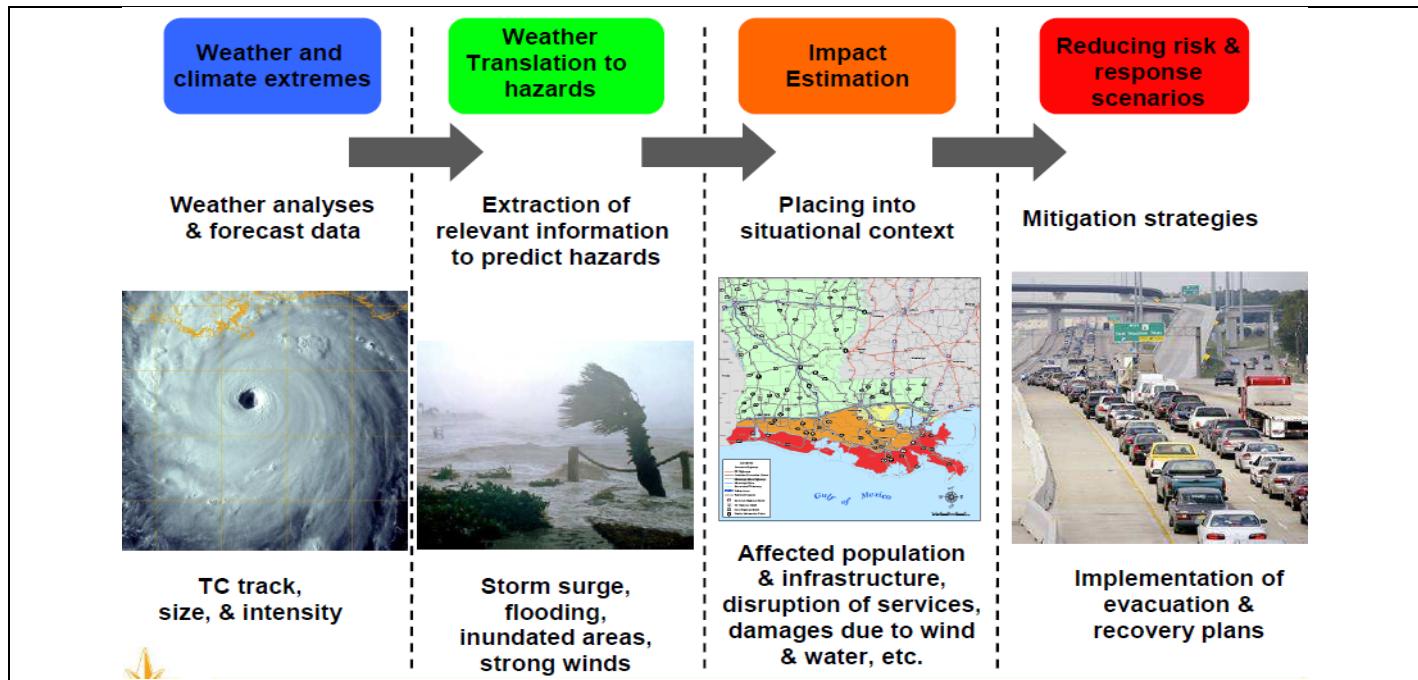


countryside, such as indigenous communities who do not have the means to receive or access weather forecasts and early warning information even through common means such as TV, radio, and cellphone, there is a bigger challenge of making the EWS system more inclusive. Many stakeholders are now demanding access to risk information. Data/information on hazards and vulnerabilities at the local level are not available except in those areas where projects, usually donor-funded, were implemented . While the need for a climate and disaster risk information system is recognized, there is no still coherent strategy towards putting up such a system.

B.2. Project/programme description (max. 1,000 words)

30. The objectives of this project are to reduce the exposure of vulnerable communities to climate-induced hydrometeorological hazards, strengthen their absorptive and adaptive capacities to better manage or adjust to impacts brought about by climate shocks and climate change, and implement long-term climate risk reduction and adaptation measures. To achieve these objectives, the project will implement the following four main outputs with corresponding activities:
- i. Generating science-based multi-hazard weather and climate risk information
 - ii. Establishing a multi-hazard impact-based forecasting and early warning system (MH-IBF-EWS) supported by a knowledge and decision support system.
 - iii. Improving national and local capacities in implementing a people-centered MH-IBF-EWS and forecast-based early actions (FbA).
 - iv. Mainstreaming climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalizing a people-centered MH-IBF-EWS in the Philippines.
31. The outputs of this project follow the elements of impact-based forecast and warning services recommended by WMO as depicted in the diagram below ⁴². The proposed approach adopts the best available science and technology developed by WMO and partners to establish a multi-hazard impact-based early warning system consisting of impact-based forecasting and FbA. Output 1 of the project will generate science-based multi-hazard weather and climate risk information will be the remit of DOST-PAGASA, focusing on weather analysis and forecast data and improving observing, modeling, and predicting severe weather and climate extremes. On a national scale, this will include severe wind and heavy rainfall. At the local level, severe hazard phenomena information considered in the project such as flood, landslide, storm surge and severe wind will be translated into more usable information, which is in terms of potential impacts, with the availability and use of exposure data of the four project sites. These translation into risk-based warning in terms of impact estimation is done by placing hazard-based forecasts into situational context using exposure data such as population, housing and infrastructure, road networks, etc. and their vulnerabilities to these hazards. Outputs 1 and 2 below further elaborate on these elements, including a common understanding of the decision-making processes involved in implementing MH-IBF-EWS. Under Output 2, co-development of risk matrix, impact tables and response tables for all hazards with key collaborating agencies of NDRRMC such as OCD and DILG will be done at the national level. A national framework for MH-IBF-EWS will be developed and adopted by the NDRRMC. At the project site level, the concerned LGUs, local NGOs and community stakeholders will use this risk matrix as model. The establishment of a high performance computing infrastructure with big data analytics provides enormous computational power to improve forecasting performance. Output 3 of the project underlines the application of impact-based forecasting and warning in enhancing disaster preparedness and early action through the development of forecast-based early actions and financing (FbA) for each hazard and implementation of FbA protocols. The implementation of MH-IBF-EWS and FbA requires closer operational coordination and partnerships among forecast providers, local and national decision makers and end-users that will be institutionalized by establishing formal coordination mechanisms and SOPs, as described in Output 4 of the project. See Figure 15 in Annex 2a which depicts in a simpler way the process of shifting from a hazard-based to impact-based forecasting and early warning system service and underlining the importance of the role of end-users of warning information to minimize potential impacts.

⁴² WMO. 2015. Guidelines on Multi-hazard Impact-based Forecast and Warning Services, 2015.



Source: Haleh Kootval, WMO, Impact-based Forecast and Warning Services, Curacao, October 2016.

32. Output 1: Science-based multi-hazard weather and climate risk information is generated.

The project will allow the Philippines to adopt a new model for weather forecasting and early warning system that is multi-hazard and impact-based. Explicit in this approach is the need to shift from deterministic to probabilistic forecasting techniques that highlight not only the most likely impact, but also reasonable worst-case scenarios, which are often the cause of avoidable disasters. Adopting a probabilistic approach instead of the traditional deterministic approach leads to better forecasting performance and actionable warnings for effective disaster risk reduction.

This output will generate a science-based understanding of the hazards, i.e. flood, landslide, severe wind, and storm surge, exposure and vulnerability. Scientifically-derived weather and climate risk information are necessary in generating accurate and timely impact-based forecasts and warnings, an essential input in establishing a MH-IBF-EWS.

At the national level, probabilistic risk assessment, modeling and mapping methodologies, tools and technologies will be developed and standardized for analyzing, monitoring and forecasting four hazards, i.e. severe wind, storm surge, flood and landslide. Probabilistic hazard assessment and modelling will be undertaken for severe wind and heavy rainfall targeting all provinces in the country. For severe wind, probabilistic forecasts will be done on a daily basis. Probabilistic forecasts will be displayed using interactive risk maps showing different levels of risk within each province. Colors will be used to indicate the levels of risk on the map. Though this will use more generic assumptions about exposure by using government census data on population and buildings at the provincial level, the impact-based forecasts and warnings will still be able to alert all end-users, particularly communities at-risk, local decision-makers, NGOs, humanitarian agencies on the ground, and the general public to the possible occurrence of severe weather and its potential impacts for each level of risk. For heavy rainfall, probabilistic forecast maps will be produced for all provinces in the country. Interactive probabilistic hazard forecast maps showing the intensity of the hazard will be depicted using colors and generated on a daily basis as well.

At the local level, in the four project sites in particular, probabilistic risk assessments and mapping will be undertaken. Project sites will be used to localize the methodologies, technologies and tools for analyzing, monitoring, and forecasting four hazards, i.e. severe wind, storm surge, flood and rain-induced landslide and further calibrate them. At this level, impact-based forecasts are possible for the four hazards because of the availability of detailed exposure data, which will be collected through the project. Probabilistic forecasts of the four hazards will also be generated and visualized through interactive high-resolution risk maps of the project



sites. Local probabilistic forecast maps of each hazard will show the varying risk levels within the project sites using color codes with accompanying impact-based forecasts and warnings generated on a daily basis.

All outputs that can be visualized and displayed in both text and spatial form will be shared with and be accessible to all end-users of the information, i.e. decision-makers (local and national authorities, NGOs, humanitarian agencies) and at-risk communities through the use of a knowledge and decision support system that will be developed under Output 2.

1.1 Assess, install and upgrade observation networks in the project sites

The development of observation and monitoring systems will be undertaken to provide necessary reliable data. This activity will expand and upgrade the hydrometeorological network covering multiple climate-induced hazards (flood, landslide, storm surge, severe wind) based on an assessment and conduct of inventory. The observation network will include all weather parameters to provide an appropriate level of spatial resolution for probabilistic forecasting and local risk assessments in the project site. These installations will also contribute to the global observing network and increase performance of global forecasts (e.g. hurricanes, El Nino) as well as the downscaled local forecasts providing an essential national and global public good.

Early warning systems such as Automatic Weather Stations (AWS) will be installed in all of the proposed project sites following the standard specification requirements of the World Meteorological Organization (WMO) of a 10-meter height over open terrain. Other hydro-meteorological equipment such as water level, tide gauges, landslide monitoring devices will be procured and installed in the project sites. Below is the initial estimate on the number of hydro-meteorological equipment to be installed, which will all be procured and funded/co-financed by PAGASA:

- 1 AWS - Tuguegarao City
- 1 AWS - Legazpi City
- 1 AWS, 2 Tide Stations - Municipality of Palo
- 1 AWS - Municipality of New Bataan
- 3 units Landslide Monitoring Device (Real Time Kinematic GPS and Terrestrial Laser Scanner)

The actual number of early warning equipment to be installed will be determined during project implementation, after ground verification and actual data needed for Numerical Weather Prediction have been validated.

1.2 Establish threshold values that will cause flooding, storm surge and landslide in the project sites

Technical analysis and review of the historical meteorological events that caused flooding, storm surge and landslide will be undertaken to determine the threshold values for each hazard for each project site.

1.3 Generate probabilistic hazard maps for severe wind, storm surge, flood and landslide in the project sites

Different return periods for heavy rainfall and severe winds will be calculated to generate probabilistic hazard maps for storm surge, flood and landslide through surveys and modelling of identified project sites. These hazard maps are used for the assessment of current and future hazard scenarios and the design of climate risk management solutions that fully account for climate change considerations. These probabilistic hazard maps are inputs to development/sectoral planning, investment programming and resilience plans at national and local levels of the Output 3 of this project.

1.4 Generate national probabilistic weather forecasts for heavy rainfall and severe wind using numerical weather prediction (NWP) at the national level.

The advances in the science of climate modelling and numerical weather prediction are making weather forecasting more accurate. Establishing an ensemble forecasting system greatly increases the robustness and utility of the forecasts as it provides a range of possibilities for decision making. This system will also increase the leadtime to allow space/time for better planning and response. Upgrading the computational capacity of PAGASA is needed to provide accurate and timely weather forecasts necessary to provide site-specific hazard impacts with increased accuracy of likelihood of occurrence. With the supercomputer that will enable forecasters to have more accurate forecasts of the likelihood of the event, the accuracy of the forecasts of potential impacts will not be compromised, which will lead to increasing confidence of end-users in the warnings



and end-users making decisions based on these warnings to take early actions and mitigate potential impacts after warnings have been received.

This activity will generate ensemble prediction that allows more rapid and scientific-based comparison of multiple model forecasts, and thus provide a more robust estimate of uncertainties presented by the models' initial conditions, dynamics and physics, and atmospheric predictability. A 4x4 km ensemble system fed from the Met Office Global Ensemble system will be used. This system will be implemented in DOST-PAGASA's Cray Integrated High Performance Computing (iHPC) system. The likelihood of the threshold derived from Output 1.2 for flood, landslide, storm surge, and severe wind will then be derived with associated likelihood of happening five days or more in advance.

1.5 Generate localized flood, landslide, storm surge model forecasts and national severe wind model forecasts for project sites.

Under this activity, localized flood and landslide forecasts will be generated on a daily basis using hydrological models. For storm surge forecasts, most appropriate storm surge models will be used. National severe wind forecasts using Unified model of UK Met Office will be generated on a daily basis. Ensemble model outputs will be generated for the four hazards.

This will build on the DOST-PAGASA and the UK Met Office (UKMO) successful partnership. UKMO was contracted by DOST-PAGASA to provide weather and climate information services utilizing the Unified Model (UM) system delivered from the UKMO headquarters. Thereafter, the Philippines and the Philippine Area of Responsibility (PAR) convective scale ensemble systems for various trial periods has been running. The ensembles have generally provided a good estimate of uncertainty for various high impact weather cases, such as tropical cyclones and surface water flooding. While the model can at times be a little under spread in certain weather cases, it has proved highly valuable in providing uncertainty information around the deterministic model and in several cases the ensemble system identified very high impact events that at the same lead time are not captured in the deterministic model.

1.6 In the case of identifying Tropical Cyclones, the model has been shown to capture rapid intensification which is not possible with similar global modeling systems. These if anything are a little overdone and the risk identified as a little too high in the ensemble system. However, convective scale ensembles remain very valuable to the forecasters and as the model is being developed all the time this overestimation of extreme events may well improve in updated versions. In terms of intense precipitation from tropical convection, again the model does not underestimate the frequency of these extreme events. Certainly, forecasts from an ensemble system are probabilistic so any individual event cannot be evaluated in isolation. During project implementation, the project will remain aware of the limitations of the ensemble approach. Build exposure database at the barangay level in project sites.

In order to effectively generate risk information, a detailed exposure database is needed. For local data in the project sites, existing exposure databases will be updated and improved using already existing tools, e.g. ClimexDB, REDAS, or any available tools in the project sites. An exposure database will be developed by the LGUs. It will contain data on population, assets and activities including administrative boundaries, land ownership, building construction statistics, and socio-economic characteristics.

Capacity building for LGUs in generating exposure database will be conducted to ensure long-term sustainability. Maintenance and continuous updating of their exposure database will be done by the respective LGUs in the project sites.

1.7 Update/develop vulnerability and fragility curves for structures/buildings for severe wind, storm surge, flood and landslide.

Vulnerability models are used to estimate how much damage occurs to a given building type subjected to severe wind speeds, floods, storm surge and landslide. This is normally shown using a vulnerability curve. Incorporating the vulnerability curve into the building exposure data that provides the characteristics of buildings in a community and overlaid by the hazard map will yield information on areas that will be highly damaged.

Building structures also behave differently, depending on its characteristics. These conditions of vulnerability generally define how elements are affected by a hazard. Local scientists and engineers from University of the



Philippines and Philippine Institute of Civil Engineers jointly developed vulnerability curves for different building types. This resulted to a closer approximation of how much damage to building will be incurred at a certain wind speed and flood depth. Vulnerability and fragility curves for severe wind and flood have already been developed for 17 building types identified to be typical in the country but need to be updated. The project will thus leverage local expertise, lessons and best practices to build systems informed by local knowledge and circumstances. The project will update these knowledge, tools and database and create a sustainable system through active engagement of researchers and practitioners. Vulnerability and fragility curves for storm surge and landslide for the 17 building types will be developed. If other types of structures not included in the 17 building types were to be found in the project sites, vulnerability and fragility curves will be developed for these as well.

Combining the outputs of this activity with the detailed databases of each project site produced in Activity 1.6 and the probabilistic hazard maps produced in Activity 1.3 above, static probabilistic risk maps of the project sites will be developed. For instance, for severe wind risk analysis, the direct impact of severe wind due to tropical cyclones can be translated to a potential damage to buildings, which can be further expressed in terms of economic loss. The risk maps for the four hazards can be used by the LGUs concerned in conducting their own analysis and develop appropriate risk reduction and adaptation measures for the long-term, such as strengthening vulnerable housing structures, retrofitting critical facilities and lifelines, guide decision-making disaster response operations, and enhance their local resilience plans.

1.8 Undertake risk analysis incorporating hazard, exposure and vulnerability and assess socio-economic and gender vulnerability to identify potential impacts from extreme weather events in the project sites

This activity will involve compilation of various datasets available for characterizing hazard, vulnerability and exposure to develop a tool in quantifying risks, i.e. potential impacts. This tool will therefore be used to analyze exposure and determine potential physical, environment, social and economic impacts in the four project sites due to their respective hazards. This risk analysis tool or methodology will be used in generating impact-based forecasts and warnings and visualization maps through the knowledge and decision support system that will be developed in Output 2.

33. Output 2: Established MH-IBF-EWS supported by a knowledge and decision support system.

The project will establish a MH-IBF-EWS in the country. A national framework will be developed in order to guide all national government agencies, local government units, NGOs, academe, business and the public on the implementation of the EWS. At the local level, MH-IBF-EWS will improve availability and accessibility of impact-based warnings to end-users, particularly the last-mile communities, in a more meaningful and actionable manner.

A big part of the output is a knowledge and decision support system for meteorological operations to provide an online multi-user tool that supports multi-hazard early warnings, information and data services and impact-based forecasting which will improve decision making in climate risk management. Improved computational resources and knowledge will enable high-resolution forecasts and warnings at the interventions scale, accurately capturing the spatio-temporal details of extreme events/hazards and impacts. Significant reduction in error will lead to efficient interventions saving lives, livelihoods and assets.

The database platform consists of historical and real-time data and socio-economic data collected and sourced from different agencies and sectors. Location-specific information such as topography, watershed extents, flood, landslide, severe wind and storm surge hazard maps, population demographics and critical infrastructure are presented as overlays within the geo-spatial environment to rapidly analyze exposure as well as physical and social vulnerabilities and facilitate the quantification of impacts. The combination of evolving hazard data supports the rapid identification of exposed assets and provides a powerful workflow for forecasting social and environmental risks. Forecasting impacts will then be more understood by those at risk and those responsible for mitigating risk so that they can prepare and take appropriate early actions. An informed population that fully understands what a hazard will do is more likely to take the necessary actions that protect lives and livelihoods.

This will also aid in integrating climate risk information in local planning and programming to increase the communities' risk reduction efforts and enhance their adaptive capacity. Under this output, co-development of user-validated risk matrix, impact tables and responses table for all hazards at the national and local levels will



be done. This requires a closer collaboration and partnership between forecast providers, decision makers and end-users.

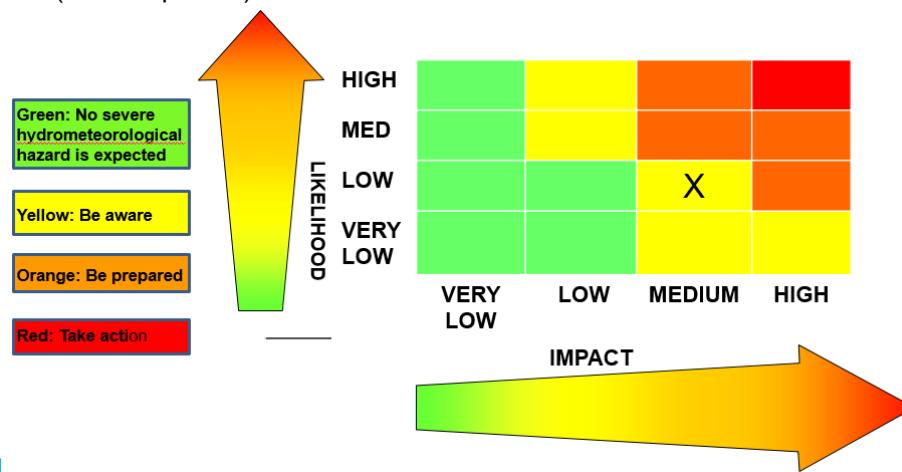
2.1 Develop the impact-based forecasting and early warning system for each hazard

This activity will support the development of a national framework for MH-IBF-EWS for the country and guide the implementation at the local level. This involves the development of the risk matrix with agreed risk levels and color codes and accompanying general impact table and general response table for each hazard in collaboration with key national and local stakeholders. These risk matrix, impact table and response table will be used as a template by the project sites and other LGUs that will implement MH-IBF-EWS in the future.

The operationally-designed decision support system will translate real/near-real time science-based weather forecast information into potential impacts and response advisories for dissemination to OCD, DILG and the NDRRMC as well as LGUs and all stakeholders in the project sites. By establishing an intelligent meteorological system using validated numerical weather prediction models and other ensemble and probabilistic models and sophisticated weather observation systems, certain thresholds can be determined corresponding to certain degree of likelihood of an expected hazard and its severity in tandem with the degree of potential impacts to generate the risk matrix. This can be supplemented by the high forecasting skills of meteorologists and atmospheric scientists.

Once the likelihood of an expected hazard and the potential impacts are determined using impact assessment models, appropriate colors can be marked on the risk matrix and color-coded warnings can be issued to the general public. To provide easy-to-understand information, action focused warnings in textual forms can also be converted into maps to visualize at a glance the geographical extent of the hazard and the color-coded warnings are reflected in the risk matrix in the web-based platform that are readily accessed and understood by local communities. Each color suggests corresponding response mechanisms necessary for communities at-risk, local and national decision makers, humanitarian agencies, and emergency managers and responders on the ground to proactively implement mitigation measures or early actions in advance of the event.

The risk matrix as shown in the figure below will be color coded to depict risk levels and corresponding warnings, i.e. Green – Very Low, Yellow – Low, Orange – Medium, Red – High Risk. It will identify the likelihood of a specific hazard event or multiple events and the potential impacts. Impacts are determined by integrating forecasts with exposure and vulnerability data and can identify specific groups of people or communities at risk. Graphical warning maps will be displayed and shared in the knowledge and decision support system (See Output 2.5).



Source: WMO.

2.2 Develop/update early warning protocols from hazard to impact-based using collaborative approaches for the project sites

Impact-based warning protocols will be developed and adopted by government through the NDRRMC for issuance, communication, and dissemination for each hazard in the identified project sites. An interagency committee for operationalizing MH-IBF-EWS (see Output 4) will be responsible for coordinating this work together with the LGUs and stakeholders in the project sites.



2.3 Develop and adopt national policy framework on MH-IBF-EWS to guide the implementation of national government, local government units and all stakeholders nationwide

Developing a jointly designed national framework on MH-IBF-EWS and corresponding guidelines including a readiness checklist for implementing MH-IBF-EWS by LGUs will be done in order to provide a common and collective understanding the EWS and facilitate the implementation of impact-based warning services.

2.4 Test and validate the impact and response tables of the project sites.

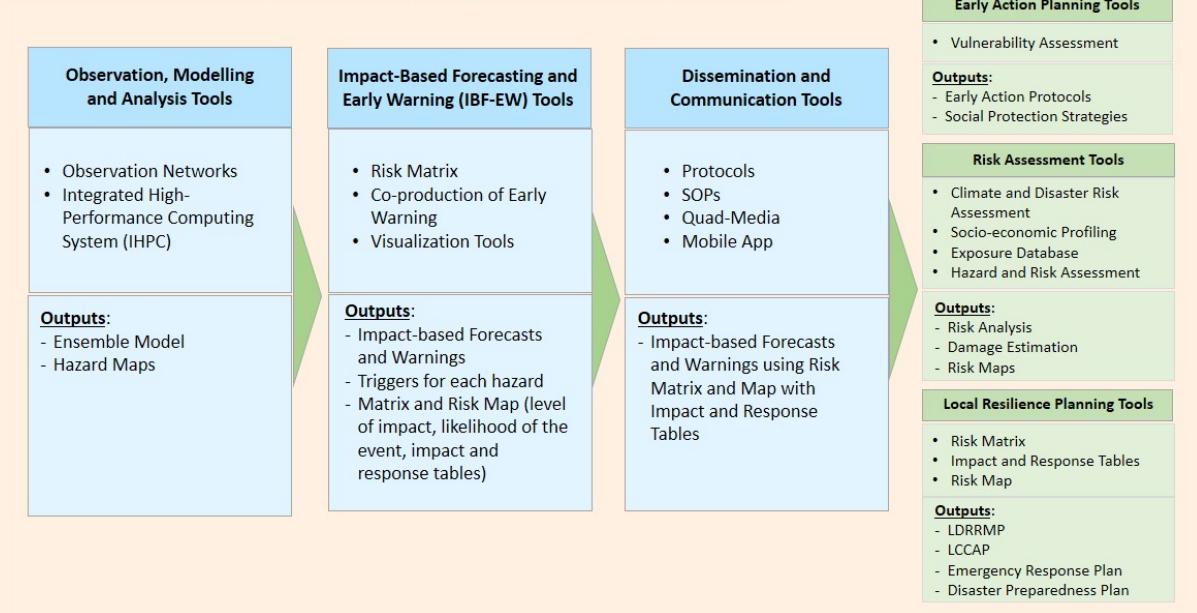
Testing and validating the impact and response tables on early warning in project sites will be done in a collaborative and participatory manner. The shift to impact-based forecasting and warning will require a design of EWS that explicitly incorporates the decision-making contexts and risk perceptions of vulnerable communities. As end-users of the last-mile of EWS, vulnerable communities will be sustainably engaged and consulted to ensure that the design of the EWS will be optimal for relevance and use. The content of warning messages will be designed to be responsive to the needs of vulnerable communities, while making sure that these are effective and actionable. Appropriate channels of information or how these warnings will be disseminated and delivered in a timely manner will be incorporated in the design of the EWS, including provisions of end-user feedback mechanisms. With various technologies available at present, it is important that warnings are received by end-users in ways that they expect, using technology with which they are familiar. This will be undertaken in conjunction with Activity 3.3.

2.5 Develop a knowledge and decision support system to support the implementation of MH-IBF-EWS

The implementation of a multi-hazard impact-based forecasting and early warning approach involves new types of meteorological and hydrological forecasting and warning information services as well as new visual and practical presentation of information, including maps, user-specific graphics and weather symbols. This will require the development of a new web-based system that is available to DOST-PAGASA and all end-users. The figure below shows the different tools that comprise the knowledge and decision support system that will be developed by the project.

Knowledge and Decision Support System Framework

Multi-Hazard Impact-Based Forecasting and Early Warning System (MH-IBF-EWS) for the Philippines



In the figure above, the first column corresponds to DOST-PAGASA's existing technologies and tools for gathering weather and climate data and producing science-based hazard information using computing systems (i.e. contribution to the project as co-financing). These data will be processed and analyzed to come up with probabilistic hazard forecasts using models.



To support the development and implementation of multi-hazard impact-based forecasting and early warning services, the project will establish a web-based knowledge and decision support system consisting of tools and functionalities (i.e. second, third and fourth columns) that will provide hazard and risk information, interactive probabilistic forecast maps showing risk levels for all provinces in the country and more detailed forecast maps initially limited to four project sites with corresponding timely and actionable impact-based forecasts and warnings. These Impact-Based Forecasting and Early Warning tools consisting of risk matrix, visualization tools (e.g. GIS maps at different scales) and co-production of early warning messages will aide in the issuance of impact-based forecasts and warnings usable to end-users.

The KDSS is mainly meant for government agencies at the national, provincial and local levels to serve as a tool in decision- and policy making, analysis and planning. All the city/municipal governments in the project sites have the necessary equipment and access to the Internet. The mobile application version will be available to the public. For community stakeholders, as mentioned in the response to Question 1B above, for remote populations including IP communities without Internet access, traditional broadcast media such as radio and TV depending on the results of stakeholder consultations will be utilized as these are the main sources of news of the population. Increasing the accessibility of at-risk communities to warning information (local and IP communities alike) is part of the project and will be done in collaboration with the LGUs within the context of capacity building. For instance, for remote IP villages in the uplands, strategic areas with radio signal in and around the villages could be provided with solar-powered AM/FM radio as well as single-side band radios to the IP community leaders by the LGU concerned. Feedback mechanisms will be included in the EWS to take into consideration the specific needs of the IP in terms of receiving information tailor fit to their context.

The system will also have Dissemination and Communication Tools as the means through which impact-based forecasts and warnings are issued and disseminated to all end-users such as vulnerable communities, government agencies involved in disaster risk management and the general public. Protocols and SOPs will be communicated and disseminated to end-users to help them take necessary preparedness and early actions in advance of the event to minimize or avoid losses and damage to assets. The system will also have a user-friendly mobile application tool for visualizing impact-based forecasts and warnings. This will be designed to increase public engagement and feedback from end-users to transform the way climate risk information is communicated and be usable to end-users.

Communication and dissemination as an integral part of the EWS will utilize all types of media and channels to reach the project sites, especially those in remote locations, whichever modalities are deemed appropriate by the end-users and last mile communities at-risk, (e.g. satellite and mobile-cellular networks, social media, flags, sirens, bells, public address systems, radio, TV, door-to-door dispatch). Communication strategies will be evaluated to ensure messages will reach the communities in a timely manner. Agreements to utilize private sector resources where appropriate (e.g. mobile-cellular, satellite, television, radio broadcasting, amateur radio, social media) to disseminate warnings will be established.

In the Philippines, forecasts and warnings are traditionally disseminated through TV and radio broadcasts. Based on 2012 statistics, with a population of 96.7 million, the Philippines had 16.9 million TV households by the end of 2012, representing a TV household penetration rate of 79%. Television has long been the dominant media form in the Philippines and also the main source of news for the majority of Filipinos.⁴³ Figures from global market research firm Synovate show that in 2011 free-to-air TV penetration was around 98%.⁴⁴ In 1994, among Filipinos aged 10 years old and over, approximately 8 out of 10 (80.8 percent) or 40.7 million listened to radio.⁴⁵ These figures were expected to increase in the future. In terms of digital media, the Philippines is one of the top 10 Facebook users in the world, with 68 Million Facebook users as of July 2019.⁴⁶ It is also estimated that by 2021, smartphone users in the Philippines will hit 90 million, from just 40 million in 2016.⁴⁷ The project will, in short, use all available mass media such as traditional media, i.e. TV and radio, and take advantage of the popularity and availability of other platforms and means of communication such as cellphones and social media (accessed mainly by smartphones) such as Facebook among Filipinos, which are gaining ground due to faster and more affordable data services.

For remote populations, including IP communities, indigenous knowledge, systems and practices would be assessed and possibly be complemented with traditional broadcast media such as radio and TV depending on

⁴³ CASBAA. Philippines in View, CASBAA Market Research Report. 2014. Hongkong.

⁴⁴ <https://oxfordbusinessgroup.com/overview/tuning-radio-and-television-remain-strong-print-declines>).

⁴⁵ <https://psa.gov.ph/content/exposure-population-mass-media>).

⁴⁶ <https://www.statista.com/statistics/268136/top-15-countries-based-on-number-of-facebook-users/>).

⁴⁷ <http://nine.cnnphilippines.com/business/2016/07/12/smartphone-users-90-million-in-five-years.html>).



the results of stakeholder consultations. Increasing the accessibility of at-risk communities to warning information, local and IP communities alike, is part of the project and will be done in collaboration with the LGUs within the context of capacity building. For instance, for remote IP villages in the uplands, strategic areas with radio signal in and around the villages could be provided with radio by the LGU concerned. IPs are represented in the LDRRMC. It is assumed that the proportion of population with internet access and smartphones at the national level also apply at the project site level, since disaggregated data at the municipal/city level are not available.

This knowledge and decision support system will also integrate Risk Assessment tools that will enable decision-makers to analyze their risks and enhance their climate risk management efforts from preparedness to early action to emergency response as well as for long-term development and adaptation planning. This decision support tool will be accessible to emergency managers at the national level such as OCD, DILG and other key agency members of the NDRRMC as well as for the LGUs in the project sites.

Local Resilience Planning tools for use by LGUs and local decisions makers to enable them to understand their risks will also be integrated into this knowledge system. Users will be able to store, organize and manage data required to assess exposure and risks of their localities. By overlaying the hazard maps produced by DOST-PAGASA, local decision makers, disaster risk managers and emergency responders will be able to estimate potential impacts and identify measures that can minimize these impacts in the future. This knowledge system will also help in participatory vulnerability assessment and resource allocation to support the implementation of forecast-based early action protocols including social protection strategies that are agreed by at-risk communities in the project sites.

A central standardized repository (including but not limited to a Geographic Information System) will be established to store all risk information. On this project, the technical capacities of DOST-PAGASA, DENR-MGB, DILG, LGUs, OCD and NGOs on the use, operation, and maintenance of the KMP platform as well as the DSS will also be enhanced. This will allow to replicate the use of the DSS to other LGUs. The KDSS can work both online and offline. Access to information and to KDSS will be part of capacity building of the LGUs in the project sites. Capacity building is not only on the training of LGUs to use KDSS but also on improving their systems, including technological systems, up to par so they can implement IBF-EWS.

The system will be continuously calibrated and upgraded beyond project life and add more detailed local risk maps of the rest of the cities and municipalities in the country as high-resolution exposure data are gathered by local governments, DOST-PAGASA and other actors. It will also be used as a tool in training and capacity building activities on MH-IBF-EWS in the project sites that will eventually expand to provinces where they belong and nationwide thereafter.

The platform will be equipped with a Common Alert Protocol (CAP) broker and document producer for integration with regional CAP compliant systems.

2.6 Conduct simulations to test the MH-IBF-EWS and calibrate knowledge and decision support system the system on a regular basis

Assessing the performance of an impact-based forecasting and warning system and services will be done regularly. A manual of operations for the system will be developed and continuously updated.

34. Output 3: Improved national and local capacities in implementing a people-centered MH-IBF-EWS and forecast-based early actions and financing (FbA).

Capacity building to enhance institutional and technical capacities of DOST-PAGASA and the Co-executing Entities, end-users and other relevant stakeholders will be undertaken to ensure the effective operationalization of the MH-IBF-EWS and FbA down to the last mile. This capacity development program includes the conduct of trainings and knowledge sharing activities, developing/harmonizing protocols and SOPs, and updating/enhancing local resilience plans as described in Output 4.

Improved capacities will enable the mainstreaming of MH-IBF-EWS for enhanced risk-informed development and investment plans and policies as well as enhancing local resilience plans under Output 4. Improved capacities will also make multi-sectoral partnerships, including public-private partnership to be forged in Output 4 more fruitful and productive.

3.1: Conduct a gap assessment on MH-IBF-EWS of key national and local end-users.



A gap assessment of DOST-PAGASA, DENR-MGB, DILG, OCD and LGUs in the project sites will be conducted to determine their existing capabilities and available resources needed to implement a people-centered MH-IBF-EWS and Forecast-based financing and early action (FbA). For instance, this will involve the determination of the state of affairs of the technical capacity (e.g. availability of instrumentation and facilities, human resources), communication and dissemination channels for early warning, existing policies, SOPs and protocols related to EWS, institutional capacities and resource allocation for climate risk management, among others. This will include an assessment of how the indigenous communities living in the project site of New Bataan are currently engaged in the existing EWS of the municipality.

3.2 Build gender-sensitive institutional and technical capacities to implement MH-IBF-EWS.

Based on capacity gap assessment results, a gender-sensitive capacity building plan will be developed for targeted groups and training modules will be developed/updated. Trainings, workshops and knowledge sharing activities will be conducted for specific groups such as forecasters, key national agencies, LGUs, communities at-risk and indigenous communities, and key business sectors in project sites to increase their understanding of and knowledge on impact-based forecasting and early warning and on forecast-based early actions and financing. In the case of indigenous communities in New Bataan, the project will learn and build on the positive aspects of their traditional practices and values to ensure that the indigenous communities will in turn understand and appreciate the new concepts (e.g. climate change, climate projections) and tools (e.e. vulnerability assessment) that the project will introduce.

One approach of the project to scale up capacity building activities is by inviting the mayor and LDRRM officers of all cities/municipalities in the provinces of Cagayan, Albay, Leyte and Davao de Oro as well as the governors and Provincial DDRM officers to all the trainings and workshops that will be conducted in the project sites. In this manner, MH-IBF-EWS will be socialized and promoted to the whole province and not only in the project sites.

3.3 Develop localized impact tables and response tables for each hazard for the four project sites.

Impact-based forecast and warning require the translation of hazard jargon into timely, meaningful and actionable information about the likely impacts of a hazard. More quantitative impact-based forecasts will consider the vulnerability of specific locations, e.g. elevation and risk of flooding, type and quality of buildings to withstand severe wind and floodwaters, vulnerability of lifelines and critical infrastructure such as hospitals, schools and other public services, as well as the capacity of government and people to respond. Localized impact tables and response tables will also include the vulnerability of livelihood activities (e.g farming and fishing) so that impact-based forecasts and warnings are tailored to the needs of those at-risk, i.e. last-mile communities as well as local decision makers including local authorities, humanitarian actors, and local NGOs operating on the ground. Indigenous communities will also be actively engaged in the co-production of impact and response tables that will consider indigenous knowledge, systems and practices of community members.

This activity will focus on the development of a people-centered EWS by tailoring of messages, identifying the best channels for dissemination, and collecting feedback from end-users to improve the system. Activities will ensure co-production of messages through active participation of at-risk communities (i.e. indigenous communities in New Bataan) and establishment of a feedback mechanism. The establishment of feedback mechanisms will also enhance the usability of scientific information by combining it with local and indigenous knowledge. Existing cooperation and partnerships of government agencies with the academe and private sector, particularly those involving communication and dissemination of early warnings, will be further expanded or strengthened.

Under this activity, the LGUs, DILG and WFP will convene various stakeholders to guide project implementation to ensure participation and the mainstreaming of gender, social protection and accountability to affected populations in the development of solutions for the last mile. A comprehensive baseline assessment of communities at-risk as well as key local institutions will be conducted to understand their vulnerabilities and capacities. A risk perception survey will also be conducted in the project sites to determine suitable and effective messaging and means to disseminate warnings and influence behavior, taking cognizance of traditional practices, norms and beliefs that exist in the project sites. Stakeholder consultations will be conducted to get feedback from at-risk communities, particularly on the last mile messaging and communication aspects of the MH-IBF-EWS, including the business sector that participate in the weather enterprise, such as private cellular companies, TV and radio that deliver public safety information services



3.4. Develop early action protocols applicable to project sites including shock-responsive social protection

This activity will mainly focus on the implementation of the forecast-based financing and early action (FbA) component of the project in the four project sites. FbA is an innovative approach linking early warning to pre-determined early actions and the appropriate financing to do those actions. A vulnerability and risk assessment will be undertaken to understand the food security and nutrition status of the project sites to support the development of early actions at the community level to protect lives and livelihoods. This action will focus on initiating a Comprehensive Food Security and Vulnerability Assessment (CFSVA) to determine the baseline situation in the target areas. This assessment will determine how food insecure communities in the target areas make use of early warning, climate and forecast information, which institutions and agencies they trust, and how messaging should be tailored to build adaptive capacity. This assessment will serve as the starting point for designing the programming for forecast-based financing at the local level, as it will help determine priority needs of vulnerable people and the appropriate early actions that should be adopted. Identification of measures that will make social protection schemes more shock-responsive will also be conducted in consultation with concerned government agencies, private sector such as the insurance industry, and vulnerable groups.

Early action protocols will be developed for each hazard at certain impact levels relevant to the project site. Triggers that will activate the agreed FbA protocols will also be determined in collaboration with the vulnerable communities, local decision makers, private sector engaged in media, communication and transportation services and local NGOs on the ground. This will focus on convening experts for community consultations to determine the appropriate triggers and thresholds to initiate early actions in the four project sites and developing early action protocols. The impact-based forecasts developed will be presented at the local level and triggers for early actions to be taken prior a disaster will be developed to bridge the gap between the time that a forecast is released to emergency response. After these early action protocols are developed in the project sites, these will be tested through functional simulations and drills, and further refined following testing.

Harmonization of existing early action protocols and triggers such as the WFP FbF manual, LISTO manual and other existing SOPs and operational plans at both national and local levels will also be undertaken. This will focus on determining an entry point for the early action protocols developed at the local level to be fully integrated and adopted into local planning and budget, and harmonizing them with the existing protocols in place for emergency response.

The LGUs in the project sites and Co-executing Entities such as DILG and WFP will conduct the review and consultations on existing local resilience plans, i.e. LDRRMP, LCCAP, disaster preparedness plan, contingency plan, emergency operations plan and other existing protocols to integrate a window of early action into existing policies and practices at both local and national levels. This will ensure that early action protocols (EAPs) developed for the project sites are adopted into local planning and the institutionalization of FbA approach at the national level and that resources will be allocated for their implementation.

Functional simulations and drills to test and refine the early action protocols for each hazard in the project sites will be regularly conducted. These actions will focus on convening experts for community consultations to determine the appropriate triggers and thresholds to initiate early actions in the four target areas. The impact-based forecasts developed will be presented at the local level and triggers for early actions to be taken prior a disaster will be developed to bridge the gap between the time that a forecast is released to emergency relief. After these early action protocols are developed in the target areas, these will be tested through functional simulations and drills, and further refined following testing.

Climate-resilient livelihood options will be identified in the project sites in collaboration with stakeholders such as civil society, academe and private sector to promote long-term adaptation efforts in the project sites. Based on the CFSVA, consultations and capacity strengthening of the four project areas, early actions to protect climate-resilient livelihoods (i.e. early harvesting, adjustment of planting, support to food baskets/non-food items, cash-based transfers, alternative livelihood support, livestock support) will be identified and integrated into the early action protocols. This activity will leverage on the FbA initiatives of WFP in the Philippines implemented since 2015 in 10 provinces.

3.5. Develop knowledge products and information, education and communication (IEC) materials on MH-IBF-EWS including FbA and conduct advocacy and outreach starting in project sites



This activity will focus on developing products and materials to inform and educate all end-users of MH-IBF-EWS starting in the project sites to support coordination and dissemination in the project sites. Under this activity, knowledge products, e.g. e.g. manual for forecasters, developing EAPs for FbA, as well as IEC materials, e.g. leaflets, posters, videos on MH-IBF-EWS in the vernacular language, educational materials on indigenous knowledge and practices vis-a-vis early warning system information in their locality will be developed in consultation with the respective end-users. Testing and evaluation of IEC materials targeting end-users in the project sites will be conducted to evaluate their effectiveness and consequently update or enhance them as needed.

3.6 Expanding the use of MH-IBF-EWS nationwide using scenarios

The approach to expand and roll-out the MH-IBF-EWS framework from the four project sites is by including the surrounding areas, i.e. all cities and municipalities in the province where the project sites are located as well as civil society, academe and business sectors operating in the province to all advocacy and outreach activities of the project. As mentioned in Output 3.2 above, the mayors and LDDRMOs of the cities/municipalities in the concerned provinces as well as their governors and PDDRMOs will be invited to participate in all capacity building activities to be implemented in the project sites.

Using the scenario approach, the promotion of MH-IBF-EWS in the whole country will be undertaken. Knowledge products and IEC materials will be disseminated to LGUs in the country. Dissemination and outreach activities will take advantage of regular advocacy activities of the government, for instance, annual resilience caravans of OCD, PAGASA Typhoon and Flood Awareness Week, National Science and Technology Week, WMO Day, Monthly Climate Forum, among others; use of traditional media such as local radio programs and social media such as Twitter and Facebook and other communication channels.

Conduct of peer-to-peer learning workshops on FbA to share and disseminate best practices, lessons learned and experiences by stakeholders. The LGUs in project sites, DILG and WFP will conduct multistakeholders forum on FbA and convene technical workshops to share evidence-based best practices and challenges.

35. Output 4. Mainstreamed climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalized people-centered MH-IBF-EWS in the Philippines.

Mainstreaming of impact-based early warning systems as a climate risk management strategy in development planning processes at national and local levels of governments will be undertaken. Mainstreaming climate impact forecast and risk information into sectoral development planning processes and effective integration of EWS with institutional and policy-making processes can enhance the sustainability of development programs and projects and decrease the vulnerability of communities from climate-related risks. Integrating MH-IBF-EWS in investment programming is necessary to ensure that the necessary resources for related activities and equipment (e.g. maintenance costs of AWS) will be allocated. This is also in support of the Joint Memorandum Circular 2015-01 which legally requires LGUs to tag and track their climate change expenditures in their Annual Investment Program. Specifically, LGUs must identify, prioritize and tag climate change programs, activities and projects and report climate change expenditures.

This output aims to effect a more coherent, risk and evidence-based development policies and plans, investment programs at the national and local levels and facilitate the institutionalization of MH-IBF-EWS and climate risk information in local policies, plans and budgets.

This output will also involve the expansion of mutually beneficial multi-stakeholder partnerships to mobilize and share knowledge, expertise, technologies and financial resources to support the implementation of MH-IBF-EWS in the country. The private sector, particularly business entities actively involved in providing public safety services such as communication services, media, transportation services, etc. in varying extent in the full value chain of activities, from observations to data acquisition tools and technologies, information generation and processing technologies, to product dissemination and services, will be recognized as a set of stakeholders in end-to-end early warning service delivery supporting the implementation of MH-IBF-EWS.

4.1 Enhance existing manuals and guidebooks on integrating MH-IBF-EWS and FbA in national and local resilience planning processes



A review of all existing manuals, guidebooks, plans and SOPs such as the NDDRM Framework and Plan, National Disaster Preparedness Plan, National Disaster Response Plan, NCCAP, pre-disaster risk assessment, incident command system, service continuity plans, etc. will be conducted. This output will then enhance and harmonize existing manuals and guidebooks on integrating MH-IBF-EWS and FbA in national and local resilience planning processes. The output will ensure that at all levels, the manuals/guidebooks produced on MH-IBF-EWS will help guide the mainstreaming in national and local plans, i.e. N/LDRRMP, national/local climate change action plan (N/LCCAP), local disaster preparedness and response plans, contingency plans and other local resilience plans.⁴⁸ The manuals/guidebooks will spell out coordination mechanisms and structures among national and local levels to efficiently implement the impact-based EWS. This will contribute to make climate risk management in the country more proactive and inclusive.

4.2 Strengthen national inter-agency operational coordination mechanisms at the national level to implement MH-IBF-EWS

Underpinning these policy and planning enhancements are the institutional strengthening of the inter-agency operational coordination mechanisms at the national level. This output will strengthen and ensure seamless interoperability coordination mechanism amongst DOST-PAGASA, DENR-MGB, OCD and DILG and other key national/local agencies as coordinated by the NDRRMC by creating an inter-agency committee on MH-IBF-EWS headed by DILG and DOST-PAGASA with OCD as secretariat. This inter-agency operational body will include representatives from the private sector, academe and civil society engaged in end-to-end early warning systems. Each collaborating agency will enhance/develop their own respective early warning SOPs mainstreamed with the MH-IBF-EWS to fully realize the operational readiness to address the hazards.

Strong inter-agency partnership along with close engagement of stakeholders and end-users supported by policy declaration with robust participation of the communities will be necessary in every step of the EWS process. From co-developing the risk-matrix, impact and response tables and early warning messages with active involvement of all key players in determining effective dissemination channels to agreeing on priority early actions that at-risk communities will undertake upon receiving the alerts in advance of the event. In order to effectively implement and deliver the MH-IBF-EWS Project, regular coordination meetings and communication (monthly progress reporting/tracking, and quarterly impact assessment) to include task and commitment monitoring among members of the interagency body will be conducted to cultivate a common understanding of all aspects of MH-IBF-EWS. Transparency in decision making and information sharing will be practiced.

4.3 Develop multi-stakeholder partnerships at the national and local levels for FbA and social protection

Strengthening adaptive capacities and resilience from the national level down to the community level requires collaborative partnerships across all levels of government, civil society, academe, private sector, and other stakeholders. A government-led national technical working group (TWG) on FbA will be formed by building on the existing TWG on FbF chaired by WFP, PRC and FAO. A Memorandum of Agreement (MOA) to institutionalize FbA among the different actors and national government will be drafted and signed by relevant agencies, similar to the MOA signed between the Department of Social Welfare and Development (DSWD) and WFP.

A Task Force or Local Inter-Agency Committee will be organized at the LGU level supported by a policy declaration (i.e. SB Resolution or an Executive Order) in the project sites. The task force or local committee will strengthen linkages with at-risk communities to ensure close coordination and smooth implementation of early actions during the lead time.

36. The theory of change (Annex 2a) illustrates how the outputs and activities of the project contribute to the attainment of long-term objectives and how the resulting project impacts can be sustained, replicated and scaled up. The detailed project-level Logframe is provided as Table 12 in Annex 2a.
37. An environmental and social assessment has been conducted for the project in order to identify and evaluate the project's potential environmental and social impacts. To ensure that impacts are managed effectively and in a manner consistent with the Environmental and Social Safeguards of the GCF, preventive and mitigating

⁴⁸ In this Funding Proposal, all these related local plans are referred to as **local resilience plans**. See footnote 10.



measures has been prepared so that environmental and social considerations are reflected throughout the project stages.

38. As evaluated in the assessment, the project is expected to have minimal environmental and social impacts and is more likely to generate beneficial impacts. It is expected that potential environmental and social impacts would emanate only from structural interventions such as installation of EWS including Automatic Weather Stations (AWSs) and other hydro-meteorological equipment such as water level, tide gauges, and landslide monitoring devices. The project will ensure that all equipment to be purchased meets international environmental, safety and technical standards.
39. AWSs are typically installed within local government owned properties such as state universities, municipalities, barangay, etc. Since obstructions such as trees will affect the readings of the AWSs, increase in removal of vegetation is likely to occur. During project design phase, the selected project site will be carefully assessed and will be situated away from the influence of obstructions such as trees. Moreover, AWSs will be installed in all of the proposed project sites following the standard specification requirements of the World Meteorological Organization (WMO) of a 10-meter height over open terrain. If removal of vegetation is deemed necessary, the removal will only be limited to the required number of trees. The project will also ensure that relevant permitting requirements will be secured and terms and conditions will be followed.
40. Other significant negative environmental and social impacts which would potentially occur from the installation works of AWSs include noise pollution from machinery and equipment, increase in generation of solid wastes, and increase in dust emissions as a result of excavation and civil works during the installation of the AWSs especially in new sites. These impacts will affect, albeit temporarily, occupational health and safety of workers to be involved during construction works and surrounding locality in close proximity to the selected local government owned properties. In order to reduce potential impacts of these hazards, the project shall ensure that proper personal protective equipment (PPE) is worn by the workers during equipment installation.
41. The project will not require land acquisition and/or resettlement of local population. Should the project need to install in areas within the vicinity of physical cultural properties, protected areas or natural monuments, appropriate steps will be taken to ensure minimal impacts in these special zones. Considering the indigenous populations, specifically the Mansaka and Mandaya tribes in New Bataan, they shall be informed of the project activities and consulted as the project progresses. Feedback from the IPs will also be useful to improve the project's responsiveness.
42. After the assessment and considering all project activities, the project has been recommended as having low or minimal adverse environmental impact. Moreover, the project shall be beneficial to the communities and stakeholders involved. Thus, the proposed project is classified as Category C or will not have significant adverse environmental and social impacts.
43. LANDBANK aims to address stakeholders' complaints related to issues where programmes/projects supported by the GCF have failed to respect E&S safeguards, as well as disputes arising from deviations in expected performance of GCF programmes/projects. Through GRM, people or communities adversely affected by the programme/project are assured of being heard, assisted, and provided with appropriate remedy on complaints/problems raised in a timely manner.
44. The GRM is anchored on the LANDBANK EO No. 092, Series of 2016 – Guidelines on LANDBANK's Customer Assistance Management, which cover the policies and procedures in handling customer inquiries, requests, or complaints (i.e., issues, concerns).
45. To supplement the Bank's guidelines on Customer Assistance Management to facilitate application with the GCF programmes/projects, the following additional guidelines are issued:
 - 1) The LANDBANK's Environmental Program & Management Department (EPMD) is the unit responsible for stakeholder inquiries, requests, and complaints related to GCF-supported programmes/projects.
 - 2) Where the EE for a given GCF programme/project is an organization or agency other than LANDBANK, the EE concerned is required to set up its own GRM. The Subsidiary Agreement executed between LANDBANK and the EE shall include provisions for implementation by the EE of its own GRM.



- 3) Relevant contact details and information for forwarding inquiries, requests, or complaints from stakeholders is included in the LANDBANK website, as follows:

Environmental Program & Management Department
27F LANDBANK Plaza
1598 M.H. Del Pilar corner Dr. J. Quintos Sts.
Malate, Manila, Philippines
Email: lbp.epmd@mail.landbank.com

Stakeholders concerned shall be informed of the GRM system and procedures during the Stakeholders' consultation activities conducted for GCF programmes/projects.

B.3. Implementation / institutional arrangements (max. 750 words)

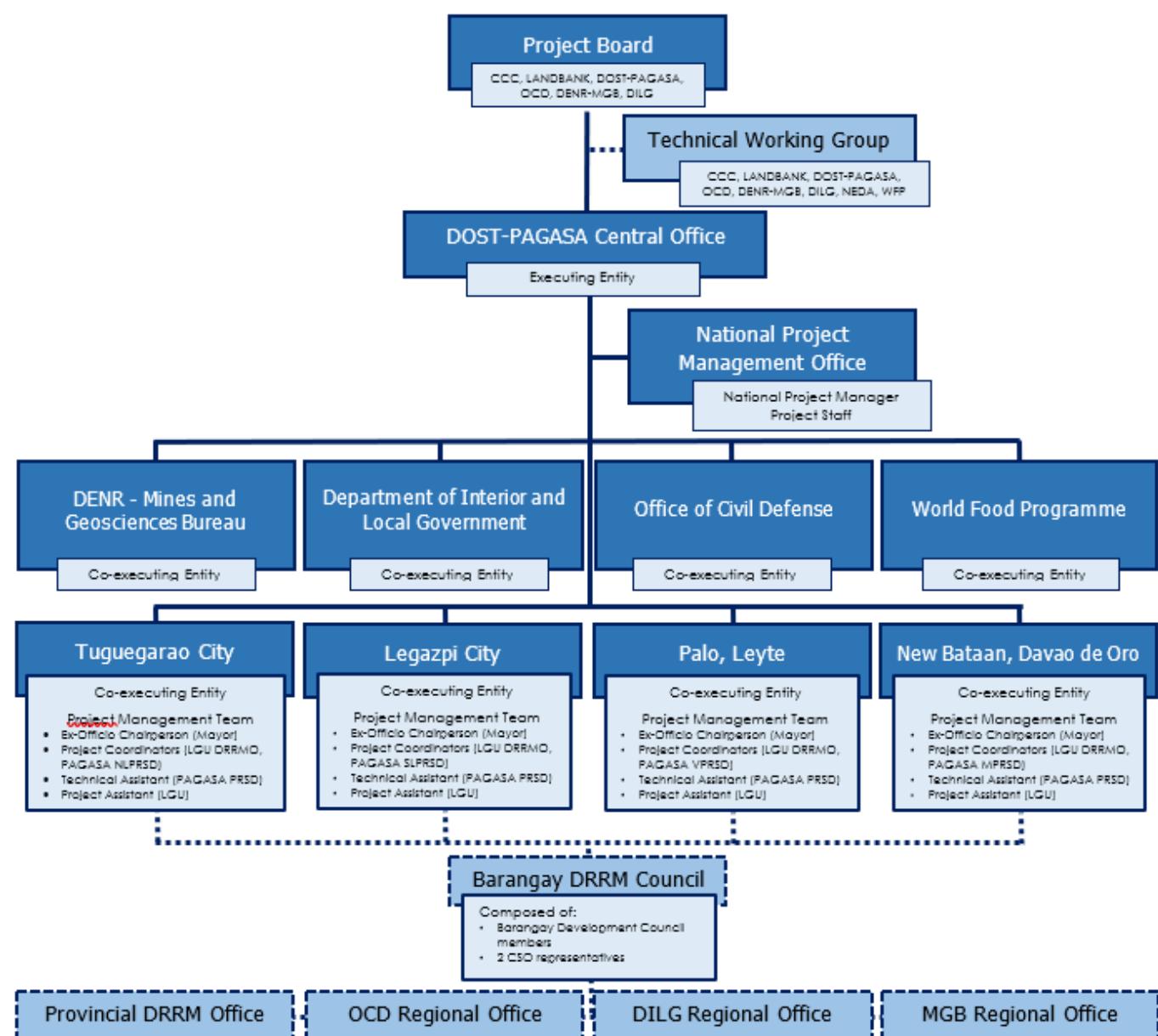
46. LANDBANK as the accredited entity will carry out this project and apply the experiences it has gained in implementing various Official Development Assistance (ODA) projects (loans or grants) from multilateral and bilateral funding institutions. This includes applying the results management, monitoring and verification concepts and approaches learned as may be applicable to this project.
47. In line with the Accreditation Master Agreement that sets forth, among others, the general terms and conditions between the Parties in connection with Funded Activity, the Land Bank of the Philippines will enter into Funded Activity Agreement with the Green Climate Fund. Furthermore, the Accredited Entity will carry out the project through signing a Subsidiary Agreement (SA) with DOST-PAGASA as the lead EE, as well as with the Co-Executing Entities (DENR-MGB, DILG, OCD, WFP, LGUs).
48. LANDBANK will be responsible for overseeing, supervising, managing and monitoring the over-all GCF-approved projects and programs to achieve specified results with guidance from a Project Operations Manual, which LANDBANK and DOST-PAGASA would prepare. A GCF Program Team shall be established by LANDBANK which shall conduct supervisory mission twice a year during the implementation period to ensure that the Project is being implemented in accordance with the legal agreements that the Bank have entered into with the GCF. In addition, the LANDBANK shall provide constant advice and guidance to the entities that will implement the project in terms of technical aspects, fiduciary requirements, environmental & social aspects, and monitoring & evaluation.
49. DOST-PAGASA will be the Executing Entity and will serve as the Project's lead "Implementing Agency". Partner agencies like DILG, DENR-MGB, OCD, concerned project site LGU and WFP which will implement specific project activities will be called "Co-executing Entities". The Co-executing Entities will be allowed to procure and disburse funds under the supervision of the EE. The Co-executing Entities' work & financial plan, procurement plan, M&E plan, among others, will be reviewed and monitored by the EE to ensure their alignment with the Project's LogFrame and proper/effective implementation. Hence, LANDBANK will sign a Subsidiary Agreement with DOST-PAGASA as the lead EE, and with the Co-executing Entities.
50. While the overall execution/implementation of project will rest upon the DOST-PAGASA as an executing entity, outputs and activities/sub-activities will be implemented by Co-executing Entities. Project implementation structure is presented below. The project will engage the following organizations in achieving project outputs.
51. DOST-PAGASA – Executing Entity, implements activities related to enhancement of observation network in selected target areas; development of probabilistic hazard maps and probabilistic forecast using numerical weather prediction and modelling; risk matrix for impact-based forecasting and warning with the involvement of stakeholders, integrated knowledge system and decision support platform for MH-IBF-EWS; and conduct of risk analysis and assessment incorporating vulnerability exposure and hazard, among others.
52. DENR-MGB – Co-Executing Entity, responsible for generation of landslide hazard maps and establishing threshold values for landslide. Being a core member of the multi-agency Pre-Disaster Risk Assessment (PDRA) group, provides valuable inputs in the preparedness efforts of the NDRRMC whenever there are forthcoming hydrometeorological and other hazard events threatening the country. The information provided by DENR-MGB is utilized by the DILG, LGUs, Department of Social Work and Development and other national



government agencies with disaster preparedness and response mandates in making the necessary preparations appropriate for various levels of risks.

53. DILG – Co-Executing Entity, responsible for advocacy, outreach and public awareness on MH-IBF-EWS, capacity building of local government units to effectively deliver climate risk information and training of communities and local first-responders, and update/establish disaster preparedness and response protocols using impact-based early warning system.
54. OCD –Co-Executing Entity, as implementing arm of the National Disaster Risk Reduction and Management Council (NDRRMC), OCD facilitates inter-agency coordination, mobilize resources for disaster preparedness and response and information management including communications at the national and regional levels. As such, it will be responsible for developing and ensuring the implementation of national standards, protocols and SOPs in coordination with key government agency members of the NDRRMC, including impact-based early warning systems and FbA policies to be developed under this proposal.
55. WFP – Co-Executing Entity, who will lead in activities related to FbA and shock-responsive social protection, including development of index-based triggers and SOPs aligned with impact-based forecasting and warning system. WFP is the leading humanitarian organization in saving lives and changing lives, delivering food assistance in emergencies and working with communities to improve nutrition and build resilience. WFP is governed by a 36-member Executive Board. It works closely with its two Rome-based sister organizations, the Food and Agriculture Organization and the International Fund for Agricultural Development. WFP partners with more than 1,000 national and international NGOs to provide food assistance and tackle the underlying causes of hunger.
56. Four LGUs – Co-Executing Entities, responsible for leading all activities in the project sites, such as building the exposure database with population and socio-economic variable, housing and building data and for gathering data in the field, identifying forecast-based actions and financing mechanisms, adopting early action protocols (EAPs), implementing the EAPs and identified alternative resilient livelihood options, integrating MH-IBF-EWS and FbA in their respective local resilience plans, among others. As project beneficiaries, they will be capacitated to become more proactive in disaster preparedness and response to implement early actions and resource mobilization such as pre-emptive evacuation, prepositioning of assets and resources, etc. The Barangay DRRM (BDRRM) Councils of each LGU will be engaged and consulted in all activities at the project site level and participate in capacity building workshops, etc. The BDRRM Council is composed of the Barangay Development Council members and at least 2 CSO representatives from existing and active people's organizations representing the most vulnerable and marginalized groups in the barangay as mandated by the Local Government Code.
57. A Project Board consisting of DOST-PAGASA, CCC, LANDBANK, OCD, DENR-MGB and DILG will be set up at the national level to provide project oversight and discuss strategic concerns. The Project Board, with the assistance of the Technical Working Group (TWG), will review and approve the plans of DOST-PAGASA and the Co-executing Entities as well as oversee their performance. The TWG composed of the members of the Project Board together with NEDA, and World Food Programme (WFP) will meet regularly to discuss technical and operational issues and guide project implementation.⁴⁹

⁴⁹ DOST-PAGASA has coordinated with WMO requesting their involvement in the project. WMO has agreed to provide technical expertise. The MH-IBF-EWS Project Team will consult with WMO at critical points during project implementation. DOST-PAGASA is a member of the World Meteorological Organization (WMO). WMO provides yearly training on IBF through the Severe Weather Forecasting Development Project



Note: The BDRRM Council is composed of the Barangay Development Council members and at least 2 CSO representatives from existing and active people's organizations representing the most vulnerable and marginalized groups in the barangay as mandated by the Local Government Code.

A National Project Management Office will be established within DOST-PAGASA manned by a project-hired Project Manager and five (5) staff who will be under the supervision of the DOST-PAGASA Administrator. Program Management Office (PMO) and a Project Management Team (PMT) will also be established in each of the four project sites. A project site PMT will be composed of DOST-PAGASA-PRSD, LGU DRRMO, and two (2) project-hired staff, in coordination with the local offices of DILG, MGB and OCD, will be established to manage the implementation at the project site. The Mayor will serve as ex-officio head of the PMT in his/her area of jurisdiction.



C. FINANCING INFORMATION															
C.1. Total financing															
(a) Requested GCF funding (i + ii + iii + iv + v + vi)	9,999,042.27			USD (\$)											
GCF Financial Instrument	Amount		Currency	Tenor		Pricing									
(i) Senior loans	0		Options	Enter years		Enter %									
(ii) Subordinated loans	0		Options	Enter years		Enter %									
(iii) Equity	0		Options			Enter % equity return									
(iv) Guarantees	0		Options	Enter years		Enter %									
(v) Reimbursable grants	0		Options												
(vi) Grants	9,999,042.27		USD (\$)												
(b) Co-financing information	Total amount			Currency											
	10,192,307.69			USD (\$)											
Name of institution	Financial instrument	Amount	Currency	Tenor	Pricing	Seniority									
DOST-PAGASA	In kind	10,192,307.69	USD (\$)	Enter years	Enter%	Options									
Click here to enter text.	Options	Enter amount	Options	Enter years	Enter%	Options									
Click here to enter text.	Options	Enter amount	Options	Enter years	Enter%	Options									
Click here to enter text.	Options	Enter amount	Options	Enter years	Enter%	Options									
(c) Total investment (c) = (a)+(b)	Amount			Currency											
	20,191,349.96			USD (\$)											
(d) Co-financing ratio (d) = (b)/(a)	102 percent														
(e) Other financing arrangements for the project/programme (max 1/2 page)	Co-financing are budgetary allocations from the Government of the Philippines to DOST-PAGASA specifically to finance the purchase of equipment and software under Outputs 1 & 2. Technically, said co-financing will be provided to the project in-kind in the form of equipment and software.														
C.2. Financing by component															
Please provide an estimate of the cost per component (as outlined in Section B.2. above) and disaggregate by sources of financing.															
OUTPUT	Indicative cost (USD)	GCF financing		Co-financing											
		Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions									
Science-based multi-hazard weather and climate risk information is generated	14,087,084.58	3,894,776.88	Grant	10,192,307.69	In kind	DOST-PAGASA									
Established multi-hazard impact-based forecasting and early warning system (MH-IBF-EWS) supported by a knowledge and	3,120,000.00	3,120,000.00	Grant	-											



decision support system.						
Improved national and local capacities in implementing a people-centered MH-IBF-EWS and forecast-based early actions (FbA).	1,939,692.31	1,939,692.31	Grant	-		
Mainstreamed climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalized people-centered MH-IBF-EWS in the Philippines.	511,207.69	511,207.69	Grant	-		
Project Management Cost	533,365.38	533,365.38	Grant	-		
TOTAL	20,191,349.96	9,999,042.27		10,192,307.69		

Detailed information on the costs of the activities are provided in Annex 3-Budget.

C.3. Justification for GCF funding request (max. 500 words)

58. The Government of the Philippines is committed to the improvement of its forecasting and climate information systems. However, budget constraints due to large investments in poverty alleviation and infrastructure limit the resources available for other activities. As disasters strike more frequently, the cost of disaster response and mitigation also increases. But the national budget continues to lag behind, unable to meet the country's many competing needs. The composition of government expenditures, particularly the share of non-mandatory expenses, leaves little room for flexibility to allow a bigger impact on disaster spending. In the case of LGUs, they have varying disaster-related expenditure demands and revenue-raising capacities which are both affected by the incidence and severity of calamities that strike them.
59. While it cannot be denied that there have been significant innovations in the area of disaster preparedness and considerable amount of funds spent for the said phase, its various elements are continuously being challenged. Community participation and decentralization is ensured through the delegation of authority and resources to local levels, but existing financial constraints continue to affect the capacity of certain LGUs for effective disaster preparedness and response.
60. **GCF Funding requirement.** Currently, DOST-PAGASA is upgrading its physical resources and operational techniques through acquisition and development of state-of-the-art instruments, equipment, facilities, and systems which are needed in the development of impact-based forecasting and warning. GCF support is critical to fully implement a MH-IBF-EWS and enable additional investments that allow scaling up of existing efforts for transformative reach and impact across the country. Improving climate risk management systems and enhancing capacities to establish and use impact-based forecasting and early warning are a key priority of the country. According to WMO, the total cost of DOST-PAGASA's improvement for to reach international standards as a warning agency is USD 32.7 Million over a five-year period.⁵⁰ The government is constrained by limited financial and human resources among the relevant national government agencies and partners.

⁵⁰ World Bank, UNISDR, PAGASA, GFDRR and WMO. 2010. *Strengthening of Hydrometeorological Service of Southeast Asia: Country Assessment Report for the Philippines.*



Without GCF support, it would take considerable time and resources before the institution of a nationwide people-centered MH-IBF-EWS.

61. With GCF assistance, it is envisaged that financial, technical capacity, and physical investment gaps in making MH-IBF-EWS a reality will be addressed at full-scale. International cooperation is always needed for such undertakings and so existing bilateral and multi-lateral partnerships and collaboration will be continued and leveraged. Through a multi-stakeholder approach and a more intentional approach of mainstreaming climate risk management policy making, planning and investment programming, the project will uphold transparency of climate information and accountability among concerned public and private actors in ensuring that vulnerability and risks of communities, livelihoods, and infrastructure are reduced.
62. Alternative funding options. There are limited funding options for DOST-PAGASA to undertake the extensive investments outlined under the Modernization Plan. GCF involvement will be critical for DOST-PAGASA to adequately embark on impact-based forecasting and early warning service as a measure to provide complementarity to the initiatives it has undertaken. In the context of other countries shifting to impact-based forecasting and early warning, this GCF investment can be deemed as contribution to a global public good. The provision of accurate, timely and actionable warnings will also facilitate business sector activities and investments and may encourage the private sector such as the insurance and reinsurance industry to provide more appropriate insurance products to households, local business, agriculture sector, and public sector.
63. Level of concessionality from GCF. As the project is focused on delivering public goods, the Government of the Philippines, through DOST-PAGASA and LANDBANK, is requesting 100% concessionality (grant funding) from GCF. Climate shocks represent a large economic and financial burden outstripping what the national public finance can manage. Moreover, the project will not yield any direct profit to the Government of the Philippines or DOST-PAGASA as it is designed to provide public services in the form of accurate and timely weather forecasts and climate services.

C.4. Exit strategy and sustainability (max. 250 words)

64. By end of the GCF project, DOST-PAGASA, will be institutionally, technically, and technologically equipped and trained to maintain the modelling, forecasting and early warning systems and scale-up MH-IBF-EWS countrywide. The development of MH-IBF-EWS is part of the priorities of DOST-PAGASA's Strategic Plan (2018-2022) and thus will be fully integrated into the budget of the agency, therefore operation and maintenance costs of the meteorological and hydrological monitoring equipment will be its responsibility. Annually, DOST-PAGASA submits its budget proposal to the Department of Budget and Management to cover expenses for its various activities such as General Administration and Support, Support to Operations, and Operations, i.e. Weather and Climate Monitoring, Forecasting and Warning; Flood Monitoring, Forecasting and Warning and Research and Development on Atmospheric, Geophysical and Astronomical and Allied Sciences. Under the General Appropriations Act of 2019, USD 3,503,608.00 (Php 178,375,000.00) has been allocated for these activities. The operation and maintenance, installation, construction and repair expenses of DOST-PAGASA facilities are charged against the "Support to Operations Program."
65. In addition, DOST-PAGASA typically installs weather observing and monitoring equipment in its existing 59 weather observing stations (e.g. synoptic, agromet, etc.) located strategically across the country. This is to ensure the security of the facilities and equipment to ensure the continuous operations of these facilities. Automatic Weather Stations (AWS) will be procured and installed during the first year of the project implementation. The estimated total unit cost is P1.4M, including installation works. The land requirement for AWS and tide station are 36 sq. m. and 9 sq.m., respectively. A typical synoptic station has an lot area of at least 500sq.m AWSs are also installed in local government owned properties such as state universities, municipalities, barangay, etc. A Memorandum of Agreement or a Deed of Usufruct in this case will be executed between DOST-PAGASA and the concerned LGU to ensure the security and continuous operations of the facilities. A Memorandum of Agreement (MOA) will also be signed between the DOST-PAGASA and the concerned barangay/s stipulating the barangay's agreement to keep watch of the installed equipment. The communities then have a sense of ownership over the system. DOST-PAGASA will still regularly check and maintain the system. DOST-PAGASA has learned lessons when it comes to protecting its investments in equipment and facilities and will bring this forward to this GCF project to ensure project sustainability. One significant lesson is that local government units in past projects were not able to maintain and keep the equipment operational due to the fast turnover of its trained personnel and for other reasons, when procured equipment were turned over completely to them. Hence, DOST-PAGASA has made it its policy that all procured equipment will be operated and maintained by its Regional Services Divisions. All equipment installed and procured through this GCF project will be considered as properties of DOST-PAGASA, become a part of its



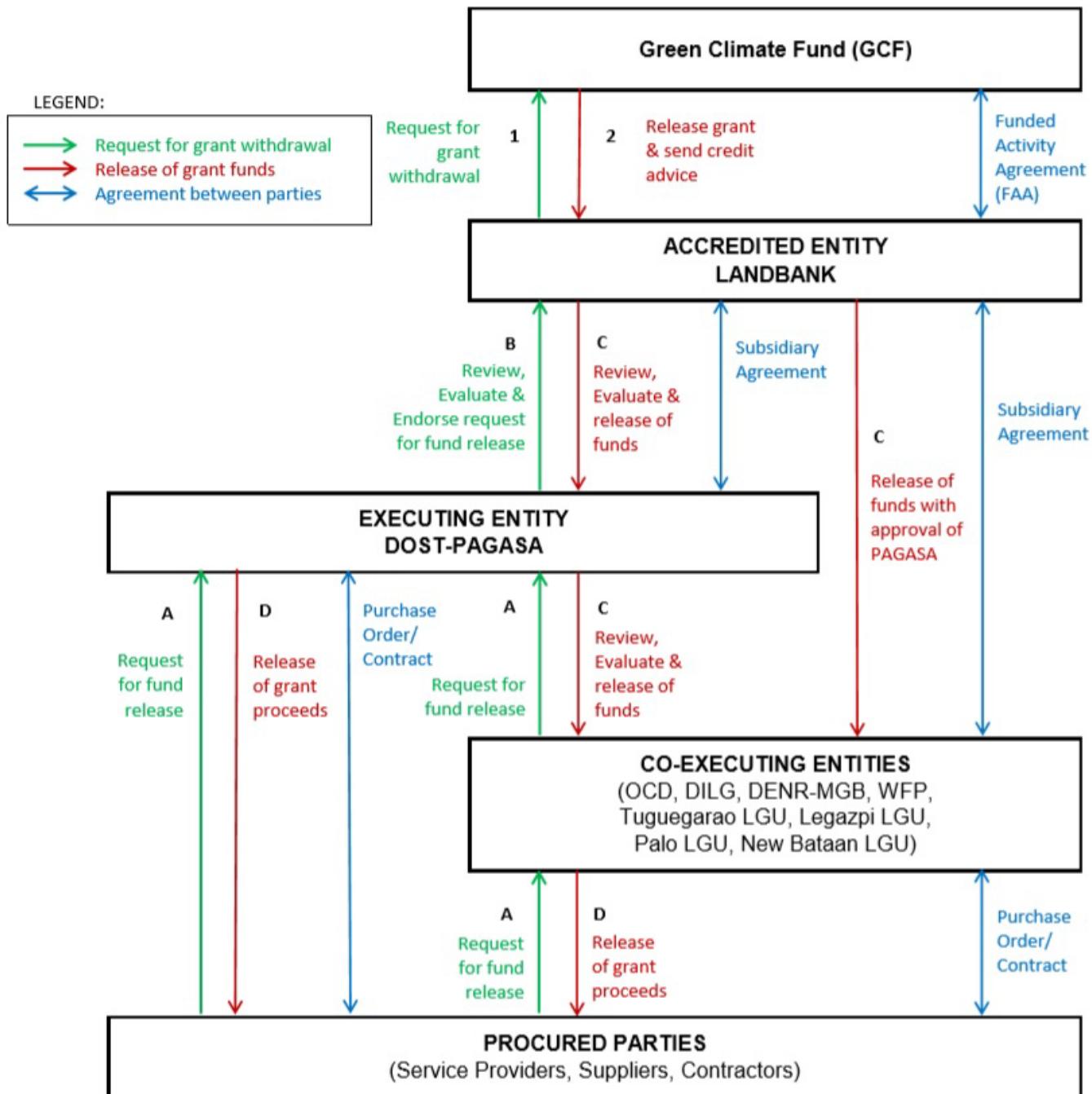
- observing network and will therefore be included in its Operations and Maintenance Plan and yearly budget allocation. Further, through its Engineering and Techniques Division (ETSD), DOST-PAGASA monitors the operations and conducts regular maintenance of all equipment and facilities it has installed around the country. ETSD engineers and technicians conduct scheduled inspections and repairs, whenever necessary. Continuous trainings of engineers and technicians are likewise undertaken to ensure that they have the necessary skills and knowledge for this purpose. Moreover, DOST-PAGASA includes the quality of after-sales services of the supplier during the procurement process with the preference of higher level and quality of after-sales services as part of its selection criteria.
66. The strengthened stakeholder partnership and coordination developed under Output 4 will provide the political support to allocate necessary resources by government to sustain this effort (e.g. operation and maintenance costs). Enhancing local ownership by LGUs will be done through a memorandum of agreement. The LGUs will provide a safe location and security for the selected sites where early warning equipment will be installed by the project and be responsible for the maintenance of these equipment.
67. The improved capacity of LGUs and communities under Output 4 to use climate risk information in their planning processes and practical early responses to impending extreme weather events will strengthen the potential of generated knowledge and its application to be sustained. The project includes a strong focus on community engagement, training and "Last Mile" communication solutions in order to elevate understanding of climate risks and achieve sustainable change in behaviour among local communities. Establishment and operationalization of national and local coordination mechanisms and SOPs will ensure that all stakeholders know what to do, when and how. Participation of other partners (e.g. NGOs, private sector, and academic institutions) will further promote the sustainability of this project into the long-term. The project will also pave the way to a greater involvement of private sector in the delivery of climate information products and services, risk transfer schemes and risk reduction.
68. Beyond project life, DOST-PAGASA will continue to provide impact-based forecasts and warnings nationwide. At the local scale, e.g. municipal/city, provinces, DOST-PAGASA and its Co-executing Entities will continue to provide assistance to other municipalities/cities surrounding the project sites and provinces where they belong in order to develop local-scale risk matrix with impact tables and response tables with the involvement of stakeholders. The institutionalization mechanisms of DOST-PAGASA by covering operating and maintenance costs guarantees the long-term sustainability beyond project completion.

C.5. Financial management/procurement (max. 300 words)

69. Fund disbursement will be from the GCF to LANDBANK. The project funds will be deposited in a designated account managed by LANDBANK. It is envisaged that a Subsidiary Agreement (SA) shall be signed between LANDBANK and DOST-PAGASA as the lead EE, as well as with the Co-executing Entities (DENR-MGB, DILG, OCD, WFP, LGUs). As the main grant recipient, DOST-PAGASA would ensure that the terms and conditions outlined in the SA are passed on to the Co-executing Entities as grant recipient and that payment for eligible expenditure will be released by LANDBANK to the EE and/or Co-executing Entities in order to enhance accountability and oversight. LANDBANK will not have the mandate to release/effect payment without written directive and approval from the EE (DOST-PAGASA). The fund release/payment request will strictly follow the approved Work & Financial Plan and/or Procurement Plan. Upon receipt of the request for fund release/payment from DOST-PAGASA, LANDBANK will review to ensure that requested transaction is within the budgeting parameters and aligned with the approved Work & Financial Plan and Procurement Plan. The release/utilization of funds will be monitored through an internal control framework, which depicts the fund transfer and reporting channels; it shows that funds received by the project account are then channeled through the government structure – national, regional and local – and reported back through the same channel. Succeeding releases shall be subject to submission of liquidation reports. The channel for fund disbursement and financial reporting arrangement is illustrated in the following diagram on the next page.
70. In the purchase of goods, such as equipment and instruments, as well as consulting and non-consulting services, procurement procedures will follow the Philippine Republic Act 9184, entitled "An Act Providing for the Modernization, Standardization and Regulation of the Procurement Activities of the Government and for other Purposes," otherwise known as Government Procurement Reform Act. In addition, LANDBANK will



conduct review the procurement plans of the EE and Co-EEs, and conduct procurement review on a semestral basis.





D. LOGIC FRAMEWORK AND MONITORING, REPORTING AND EVALUATION

This section refers to the project/programme's logic framework in accordance with the GCF's Performance Measurement Framework under the Results Management Framework to which the project/programme contributes as a whole, including in respect of any co-financing. This is different from the project/programme-level log frame(as there may be other impact measures for example that go beyond those defined by the GCF).

A project-level logical framework, with specific indicators, baselines and targets, means of verification and assumptions should be provided as part of Annex 2.

D.1. Paradigm shift objectives

<i>Increased climate-resilient sustainable development</i>	<p>This project will address the urgent need for a more proactive and inclusive climate risk management in the Philippines anchored on a people-centered multi-hazard impact-based forecasting and early warning systems (MH-IBF-EWS) for flood, landslide, severe wind and storm surge. A MH-IBF-EWS that is people-centered will increase the availability of, access to, and understanding of early warning, enabling end-users, particularly in the last mile, to reduce their exposure to climate risks, and strengthen their absorptive and adaptive capacities to better manage or adjust to impacts brought about by climate shocks and climate change, and increase capacities to develop long-term climate risk reduction and adaptation measures.</p> <p>The project will thus catalyze a paradigm shift from the traditional weather forecasts to multi-hazard impact-based forecasting and early warning. The project innovation includes combining best available science and local knowledge on probabilistic hazard mapping, modelling and forecasting and risk assessment. Capacity development on climate risk management, including preparedness, forecast-based early actions and financing and response will ensure that impact-based early warning services will be usable down to the last mile. Probabilistic risk assessment, mapping, and technologies will be developed to provide risk information that will inform development policies, investment programs, and resilience plans at national and local levels.</p> <p>The project will enable timely and actionable warning information to end-users, particularly the communities at-risk. By improving people's understanding of potential impacts of extreme hydrometeorological events, communities can take early mitigating actions and minimize or prevent adverse impacts on lives, livelihoods, property and economy. Improving the EWS through people's meaningful participation and communication, dissemination and information system that supports decision-making and planning by all end-users will redound to a reduction of loss of life and assets, mitigation of anticipated negative impacts of climate-induced hazards before, during and after extreme weather events, and development of a diverse range of proactive and inclusive climate risk management and adaptation strategies.</p>					
	D.2. Impacts measured by GCF indicators	Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target
						Mid-term (if applicable)
						Final
						Assumption

D.2. Impacts measured by GCF indicators

Expected Result	Indicator	Means of Verification (MoV)	Baseline	Target		Assumption
				Mid-term (if applicable)	Final	



Core Indicator	Number of direct and indirect beneficiaries* *NOTES: Direct: DOST-PAGASA, DENR-MGB, OCD and DILG staff plus local populations of Legazpi, Palo, Tuguegarao & New Bataan. Indirect Beneficiaries, according to hazard: For flood, landslide and storm surge: Provincial populations of Albay, Leyte and Davao de Oro plus Cagayan River Basin= 7,573,016 (8,040,935=total provincial populations plus Cagayan River Basin population – 467,919=direct beneficiaries) For severe wind: (using PSA data and fragility curves): total country population=101.7 million	External Evaluation Reports of the Project Annual Reports of NDRRMC, PDRRMC and CDRRMC	0	Direct Beneficiaries: At least 50% of the total population (=467,919) of the 4 project sites have access to impact-based EWS for flood, landslide, storm surge and severe wind Female beneficiaries: =116,363 Male beneficiaries: =117,597 5,000 staff of National Government Agencies and LGUs have access to impact-based EWS for flood, landslide, storm surge and severe wind Indirect Beneficiaries: For severe wind: At least 50% percent of national population (50,850,000) have access to impact-based EWS for severe wind For flood, landslide and storm surge: 3,786,508 people living in Albay, Leyte, Davao de Oro	Direct Beneficiaries: At least 80% of the total population (=467,919) of the 4 project sites have access to impact-based EWS for flood, landslide, storm surge and severe wind Female beneficiaries: =186,180 Male beneficiaries: =188,155 10,000 staff of National Government Agencies and LGUs have access to impact-based EWS for flood, landslide, storm surge and severe wind Indirect Beneficiaries: For severe wind: At least 80% of national population (81,360,000) have access to impact-based EWS for severe wind For flood, landslide and storm surge:	Project is implemented as planned
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				and Cagayan River Basin have access to impact-based EWS	6,058,412 people living in Albay, Leyte, Davao de Oro and Cagayan River Basin have access to impact-based EWS	
<i>A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions</i>	<i>A1.1 Change in expected losses of lives and economic assets (US\$) due to the impact of extreme climate-related disasters</i>	Rapid Damage and Needs Assessment reports (RDNA) Post-Disaster Needs Assessment reports (PDNA) External Surveys	Previous RDNA and PDNA reports for the LGUs in project sites (to be collected upon project commencement)	At least 50% reduction of casualties in project sites Damage and losses incurred due to extreme weather events in the past 10 years cut by at least 25% based on current price as of 2022	At least 80% reduction of casualties in project sites Damage and losses incurred due to extreme weather events in the past 10 years cut by at least 40% based on current price as of 2024	Occurrence of extreme weather events in project sites; RDANA or PDNA conducted and reported
	<i>A1.2 Number of males and females benefitting from the adoption of diversified, climate-resilient livelihoods options</i>	LDRMMC and BDRRMC situation reports	0	At least 10% of the population (5% male and 5 % female) in the project sites (=467,919)	At least 50% of the population (25% male and 25% female) in the project sites (=467,919)	Occurrence of extreme weather events in project sites; RDNA or PDNA conducted and reported



D.3. Outcomes measured by GCF indicators

Description	Indicators	Baseline	Target (MT-2022)	Target (Final-2024)	Sources and means of verification	Assumptions
A6. Increased generation and use of climate information in decision-making	A6.2 Use of climate information products/services in decision-making in climate-sensitive sectors	Current climate information products/services in decision-making in climate-sensitive sectors are hazard-based. Existing NCCAP, NDRRM Plan, National Climate Strategy Framework, NDRRM and LDRRM Situation Reports	At least 50% of the total population (467,919) of the 4 project sites use the 12-hourly risk matrix, map and impact tables for strong winds, flood and landslide projected to happen in the 4 project sites for the next 3 days for heavy rainfall and strong winds to undertake risk mitigation and early actions At least 3 government agency members of NDRRM use the 6-hourly probabilistic forecasts for heavy rainfall, strong winds, storm surge, flood and landslide generated for the next 5 days for heavy rainfall in decision-making and prioritization	At least 80% of the total population (467,919) of the 4 project sites 6-hourly probabilistic forecasts for strong winds, flood and landslide projected to happen in the 4 project sites for the next 3 days for heavy rainfall and strong winds At least 6 government agency members of NDRRM 3-hourly probabilistic forecasts for heavy rainfall, strong winds, flood and landslide projected to happen in the 4 project sites and 6-hourly probabilistic forecasts for storm surge in decision-making and prioritization	National and local climate change and DRM/DRR policies and plans; Pre-Disaster Risk Assessment (PDRA) reports of the N/P/LDRRM Councils, NDRRM and LDRRM Situation Reports	Occurrence of extreme weather events in project sites; Operational knowledge management system for MH-IBF-EWS is in place.



A5. Strengthened institutional and regulatory systems for climate and gender-responsive planning and development	A5.1 Institutional and regulatory systems that improve incentives for climate resilience and aligned with national gender mainstreaming strategy	Existing plans currently do not have MH-IBF-EWS: - National Disaster Response Plan (NDRP) - Guidelines on the Declaration of the State of Calamity - Current SOPs on EWS of NDRRMC and LGUs - Guidelines for Gawad Kalasag - Current local resilience plans of LGUs in the project sites and local development and investment plans - LISTO Manual -National Pre-Disaster Risk Assessment (PDRA) SOP	Risk matrix with impact and response tables adopted by the NDRRMC Drafted policies on early release of funds for early action, e.g. Declaration on the State of Imminent Calamity Drafted guidelines on mainstreaming MH-IBF-EWS in national and local disaster preparedness and response plans that is gender-sensitive	Risk matrix with impact and response tables adopted by the NDRRMC Adopted and implemented policies in release of funds for early action, e.g. Declaration on the State of Imminent Calamity Final guidelines on mainstreaming MH-IBF-EWS in local resilience planning and national SOPs of collaborating members of the NDRRMC that is gender-sensitive	Annual budget of the four LGUs; Local directives; Approved national and local policies, guidelines and frameworks on MH-IBF-EWS	National Disaster Response Plan (NDRP) and EWS and SOPs are using hazard-based forecasting and warning information
	A5.2 Number and level of effective coordination mechanisms	Existing coordinating bodies: - NDRRMC - National TWG on FbF - Cagayan River Basin Management Council Local mechanisms: - LDRRMC - BDRRMC	One inter-agency national committee for MH-IBF-EWS established One task force/local committee established and led by the LGUs in the project sites Coordination Mechanisms	One inter-agency national committee for MH-IBF-EWS established One task force/local committee established and led by the LGUs in the project sites Coordination Mechanisms	National and local directives activating the EOC, N/LDRRMC and PDRA. NDRRMC, LDRRMC, BDRRMC situation reports; Meeting reports	Committees and mechanisms established at the national level and different project sites are effective.



		- Local PDRA SOP	improved to Level 3 ⁵¹	improved to Level 4		
A7. Strengthened adaptive capacity and reduced exposure to climate risks	A7.1 Use by vulnerable households, communities, businesses and public-sector services of Fund-supported tools, instruments, strategies and activities to respond to climate change and variability	0- No formal use of MH-IBF- EWS climate information in the project area	At least 50% (233,960), of the total population (467,919) of the 4 project sites use EWS services, forecasts, advisories, etc. for flood, landslide and storm surge and related impact-based EW tools, strategies and activities 4 LGUs have access and use MH-IBF- EWS knowledge and decision support system;	At least 80% (374,335) of the total population (467,919) of the 4 project sites use EWS services, forecasts, advisories, etc. for flood, landslide and storm surge and related impact-based EW tools, strategies and activities 4 LGUs have access and use MH-IBF- EWS knowledge and decision support system;	Baseline and endline survey on early warning/risk perception survey	There is continued commitment and uptake of the information by targeted communities in the project sites.

⁵¹ The scale to measure the level of effectiveness is as follows: Level 1 = no coordination mechanism; Level 2= coordination mechanism in place; Level 3 = coordination mechanism in place, meeting regularly with appropriate representation (gender and decision-making authorities); Level 4 = coordination mechanism in place, meeting regularly, with appropriate representation, with appropriate information flows and monitoring of action items/issues raised.



			strategies and activities	strategies and activities		
A7.2 Number of males and females reached by climate related early warning systems and other risk reduction measures established/strengthened	0	Baseline survey on early warning system ro be undertaken	At least 50% (25% female and 25 % male) of the total population with access to EWS services, disaster preparedness and FbA in the project sites At least 50% (50,850,000) of national population reached by impact-based EWS for severe wind,	At least 80% (40% female and 40% male) of the total population with access to EWS services, disaster preparedness and FbA in the project sites At least 80% (81,360,000) of national population reached by impact-based EWS for severe wind.	LDRRMC situation report Baseline and endline survey on early warning/risk perception survey	There is continued commitment and uptake of the information by targeted communities in the project sites.



71. This M&E plan presents the details and process how M&E process will be implemented and performed by the Direct Access Entity (DAE) and Executing Entity (EE) to its Co-executing Entities. Specifically, this plan intends to:

- a) Monitor and evaluate the targets based on the approved project goals and objectives;
- b) Monitor any shortcomings and/or inefficiencies with regards to the project's delivery of inputs, timely execution of activities and production of outputs; and
- c) Record factors which enhance or deter the implementation of project outputs and deliverables.

72. PROJECT EXPECTED OUTPUTS AND DELIVERABLES

The project will produce the following outputs: i) Science-based multi-hazard weather and risk information is generated; ii) Established MH-IBF-EWS supported by a knowledge and decision support system; iii) Improved national and local capacities in implementing a people-centered MH-IBF-EWS and forecast-based early actions (FbA); and iv) Mainstreamed climate risk information and MH-IBF-EWS in development and investment planning and policy-making processes and institutionalized people-centered MH-IBF-EWS for a more proactive and inclusive climate risk management. Please refer to Section B2 and the project logical framework in Annex 2a for details.

73. INTERNAL MONITORING ACTION PLAN

Monitoring & Evaluation

Monitoring and evaluation is a tool which LANDBANK & DOST-PAGASA will employ in the management of the Project to:

- know whether implementation activities are going as planned;
- be alert to changes or early signs of problems;
- focus resources if needed;
- enable adjustment of activities and plans to respond to unexpected events; and
- build trust with stakeholders.

For the purpose of this Project, **monitoring** is defined as the continuous and systematic assessment of the implementation and performance of a project or programme over the course of its implementation cycle. The process involves ongoing collection and review of information to measure progress against programme plans and objectives. On the other hand, **evaluation** is defined as a rigorous and in-depth assessment of the progress of all aspects of a project or programme against its initial plan and objectives at a key point during its life cycle. Evaluations are typically undertaken at or near the mid-point of the project (a mid-term evaluation) and at the end of the project cycle (a final evaluation), and may be undertaken as internal or external exercises.

The Project's M&E will be anchored on the Logical Framework which is a methodology used for designing, monitoring, and evaluating development projects. It is basically a tool for planning and managing projects to establish how the programme activities will lead to the immediate outputs, and how these will lead to the desired outcomes and goal.

The M&E System shall be implemented, as follows:

1. LANDBANK and DOST-PAGASA shall use the Logical Framework matrix as approved in the Funding Proposal, to be the main basis in the monitoring and evaluation of the GCF programme/project.
2. DOST-PAGASA and the Co-Executing Entities shall conduct monitoring and prepare corresponding reports on a quarterly basis to be submitted to LANDBANK. On the other hand, LANDBANK shall conduct monitoring and prepare corresponding reports on an annual basis for submission to the CCC-NDA and GCF. The Monitoring Report will focus on tracking the progress of activities and attainment of targets using required inputs and measured on agreed performance indicators. The Co-executing Entities shall prepare monitoring report using a standard format for submission to the Project Management Office (PMO).
3. Mid-term evaluations shall be conducted in the context of any GCF-funded activity. Evaluation aims to determine the attainment of the project's intended impacts, outcomes and/or results measured in terms of the corresponding performance indicators. This will be conducted by an external consultant/third party. The Evaluation Report will follow the GCF Evaluation Report format, if any.
4. LANDBANK and DOST-PAGASA shall commission a third party to conduct an independent final evaluation upon project completion.
5. For all GCF funded activities, evaluation reports shall be disclosed publicly, in accordance with Information Disclosure policy for GCF-supported programmes/projects.

Monitoring the project expected outputs and deliverables stated above shall consider the following factors:



- a) Resource allocation (Efficiency)**
 - See whether project activities are implemented within the allocated budget
- b) Schedule of activity implementation (Effectiveness)**
 - See that the target activities are carried out within the prescribed period of time/execution
- c) Achievement of milestones**
 - Significant project accomplishments which are not within the quantifiable/expected accomplishments of the project
- d) Issues and concerns**
 - Constraints that affect the project implementation that needs management (especially the NDA, DAE and EE) action/intervention
- e) Innovations**
 - Technologies, approaches and or methods employed and introduced by the project

74. In order for the NDA, DAE and EE to effectively monitor the project's status and accomplishment, weights are assigned to each project outputs indicative of their relative cost on the approved activity budget. The assignment of weights to output activities would facilitate the design of S-curve, which would determine the project's degree of completion at any given time. Thus, following scheme shall be implemented.

Project Output	Assigned Cost	Computation*	Weight (%)
Output 1: Science-based multi-hazard weather and risk information is generated	14,087,084.58	0.70	69.77
Output 2: Established multi-hazard impact-based forecasting and early warning system (MH-IBF-EWS) supported by a knowledge and decision support system.	3,120,000.00	0.15	15.45
Output 3: Improved national and local capacities in implementing a people-centered MH-IBF-EWS and forecast-based early actions (FbA).	1,939,692.31	0.10	9.61
Output 4: Mainstreamed climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalized people-centered MH-IBF-EWS in the Philippines.	511,207.69	0.03	2.53
Total Project Cost:	19,801,533.81	0.97	97.36+

+This excludes the PMU cost, which amounts to USD 533,365.38 or 2.64 percent.

*Computation of weight per output:

$$\text{Weight per output} = \frac{\text{Total cost per output}}{\text{Total project cost}} \times 100$$

75. Project Efficiency Rating

This rating summarizes all the major elements that determine the project efficiency in a year. In an annual monitoring and evaluation procedure, physical accomplishment and financial utilization shall be assessed using the following table and computations:

Computation for Weighted Physical Target (WPT):

$$WPT = \Sigma \left(\frac{\text{Act.1 Target to date}}{\text{Act.1 TPG}} \times AW \right) + \left(\frac{\text{Act. 2 Target to date}}{\text{Act. 2 TPG}} \times AW \right) + \left(\frac{\text{Act.3 Target to date}}{\text{Act.3 TPG}} \times AW \right)$$

Computation for Weighted Physical Accomplishment (WPA):



$$\text{WPA} = \Sigma \left(\frac{\text{Act.1 Cum.Accomplishment}}{\text{Act.1 TPG}} \times \text{AW} \right) + \left(\frac{\text{Act. 2 Cum.Accomplishment}}{\text{Act. 2 TPG}} \times \text{AW} \right) + \left(\frac{\text{Act.3 Cum.Accomplishment}}{\text{Act.3 TPG}} \times \text{AW} \right)$$

76. On the other hand, in any case that the project is unable to meet an expected output on a given time, work slippage/overrun shall be reported. This refers to the value of work that the activity has been accomplished slower/faster than estimated time of completions and will likewise to cause some positive/negative impact in the succeeding years of project's implementation. To determine whether the project is ahead or behind of its work schedule, the following computation shall be used:

$$\% \text{ Work Slippage / Overrun} = \text{Total WPA} - \text{Total WPT}$$

Negative result would mean that the project has a work slippage or is behind the scheduled target of activity completion. On the other hand, positive result would mean that the project has overrun or is ahead of schedule.

77. To equate this % work slippage/overrun into actual number of months the project is ahead or behind schedule, the following computation shall be applied:

$$\text{Number of Months Ahead/Behind} = \% \text{ Work Slippage} \times \text{Project Duration}$$

78. Evaluation shall be done at Mid-Project and after Project Completion by a third party evaluator. This shall be commissioned by the EE with concurrence by the DAE. In the conduct of evaluation, the following evaluation criteria shall be observed and implemented:

1. Impact

- Result and/or long-lasting effect or consequence of the project in terms of:
 - o Economic (esp. for the increase livelihood objective of the project)
 - o Socio-cultural (i.e. community participation/adaptation to the project)
 - o Political (i.e. adoption of the LGU to the project initiatives)
 - o Technological (technologies to be introduced by the project)
 - o Institutional (i.e. linkages and partnerships between and among executing agencies)
 - o Ecological/Environmental (i.e. impact of the project to the environment)

2. Effectiveness

- Extent to which the project achieves its objective and intended outputs

3. Efficiency

- Measure of the extent to which the project has achieved its objectives using the allotted resources (i.e. funds, logistics, etc.)

4. Relevance

- Measure to the extent to which results and impacts of a project conform with the intended goals and objectives

5. Sustainability

- Ability of the project to continue and further develop the innovations and benefits it has initiated to the intended beneficiaries

79. A Monitoring and Evaluation (M&E) officer will be hired under the PMO to conduct and coordinate the M&E of the project. The M&E Officer will design a performance monitoring framework to track the project's progress towards achieving its targets. As mentioned earlier, a GCF Program Team shall be established by LANDBANK which shall conduct supervisory mission twice a year during the implementation period to ensure that the Project is being implemented in accordance with the legal agreements that the Bank have entered into with the GCF.



E. EXPECTED PERFORMANCE AGAINST INVESTMENT CRITERIA		
E.1. Impact potential (max. 300 words)		
E.1.1. Expected tons of carbon dioxide equivalent (t CO ₂ eq) to be reduced or avoided (Mitigation only)	Annual	Click here to enter text. tCO ₂ eq
	Lifetime	Click here to enter text. tCO ₂ eq
E.1.2. Expected total number of direct and indirect beneficiaries, disaggregated by gender	Direct	467,919 people Female population = 232,725
	Indirect	8,040,935 people
<i>*For both, Specify the % of female against the total number.</i>		
E.1.3. Number of beneficiaries relative to total population	Direct	0.5% (Expressed as %)
	Indirect	8.0% (Expressed as %)
80. The project is envisioned to increase resilience reduce loss of lives, properties, and livelihoods due to climate-induced threats. The direct beneficiaries of the project (directly trained under Outputs 1, 2 and 3 at the national level are estimated at 10,000. At the project site level, direct beneficiaries are estimated to be 467,919 (i.e. Tuguegarao City, Cagayan-153,502; Legazpi City, Albay-196,639; New Bataan, Compostela Valley (Davao de Oro)-47,726; and Palo, Leyte-70,052 based on 2015 Census. Indirect beneficiaries of the project, those who will benefit from receiving impact-based forecasts, early warnings and risk information that can be used for proactive preparedness and response, improved adaptation strategies, risk-sensitive land use planning and decision-making are the populations living in the Cagayan Valley River Basin (i.e. provinces of Cagayan, Cagayan, Apayao, Kalinga, Mountain Province, Ifugao, Isabela, Nueva Vizcaya, Quirino, Aurora) – 3,601,484; Albay Province with 1,314,826 people; Compostela Valley with 736,107 people; and Leyte Province with 2,388,518 people. These provinces are expected to be part of the geographic upscaling of the impact-based early warning system during and after project lifespan. Total estimated number of indirect beneficiaries is 8,040,935. Further, with the implementation of impact-based forecasting at the national level, specifically for severe wind and strong rainfall in the event of tropical cyclones or typhoons, for which probabilistic forecasts will be made at the provincial level (Output 1), the entire country population of 101.7 million will indirectly benefit from improved forecasts and warnings, of which about 50 percent are women and about 33 percent are children or boys and girls aged 0-14 years old.		
E.2. Paradigm shift potential (max. 300 words)		
81. The project will usher in a paradigm change in the fundamental way government authorities and the public understand and respond to weather forecasts and early warnings. From the traditional hazard-based forecasts and warnings, the project will drive DOST-PAGASA to innovate from its current hazard-focused approach to an integrated multi-hazard impact-based forecasting and early warning system (MH-IBF-EWS) that will enable at-risk communities, national and local authorities, humanitarian agencies and the general public to take early actions during the “window of anticipation” or “lead time” before the hazard event occurs. The proposal provides a well-articulated conceptual framework that details elements of the proposed interventions and their integration. The proposed approach also adopts the best available science and technology developed by WMO and partners to establish a multi-hazard impact-based early warning system consisting of impact-based forecasting and forecast-based actions. Firstly, the project will allow DOST-PAGASA to adopt a new model for weather forecasting, shifting from deterministic to probabilistic forecasting techniques that produce information on the most likely impacts of a severe weather event and reasonable worst-case scenarios. It also highlights the need to distinguish between forecasting an event, such as a tropical cyclone, from the potential hazards resulting from that event, e.g. flood, landslide, storm surge, and severe wind, based on which risks and impacts are to be estimated.		
82. Secondly, at the local level, MH-IBF-EWS will require translating hazard forecasts and warnings into location- and sector-specific impacts, providing tailored climate risk information directly to local and national governments, vulnerable communities and stakeholders in the project sites, and the generation of corresponding actions and protocols that can be taken before, during and after the event. Improving people's understanding of potential impacts of extreme weather events are essential in increasing the effectiveness of EWS. This change further emphasizes the expanded role of last-mile communities, particularly communities at-risk, local authorities, NGOs and humanitarian agencies on the ground, so no one is left behind. This requires active engagement and participation of end-users in designing and communicating forecasts and warnings and in decision-making processes such as planning pre-disaster preparedness measures, priority early actions that should be taken during the lead time in advance of the event, and emergency response actions to avoid loss of life, mitigate adverse impacts on livelihoods, properties, and economy and elevate the effectiveness and		



efficiency of disaster response, recovery, and rehabilitation efforts. Forecast-based early actions (FbA) including financial mechanisms required to enable such actions including identification of climate-resilient livelihoods and shock-responsive social protection strategies will become an integral part of disaster preparedness and early action plans.

83. Understanding how a climate-related hazard can produce a series of social, economic and physical impacts implies that local authorities and stakeholders will need to be involved in identifying these potential impacts in their respective localities, because this is not the sole responsibility of DOST-PAGASA and DENR-MGB (for landslides). By focusing on impacts, the identification of location- and sector-specific impacts and determination of responses to mitigate those impacts become the responsibility of both DOST-PAGASA, the producer of impact-based forecast and warning information, and the end-users of such information. Thus the proposed project will bring about a shift in the planning, managing and adapting to climate risks and require close collaboration with at-risk communities, local authorities, humanitarian agencies, and NGOs on the ground as well as national agencies such as OCD and DILG. More effective operational partnerships and coordination between DOST-PAGASA and national and local governments, NGOs and stakeholders will become the norm to enhance the delivery of climate and weather information services and effectively support climate risk management.
84. Delivering impact-based forecast and warning services will also require engaging local and national governments in adopting and mainstreaming MH-IBF-EWS. Integrating MH-IBF-EWS in local resilience planning will increase the use of climate risk information in institutional policy-making and sectoral planning processes, strengthen institutional systems for climate-responsive development planning, and mitigate medium- to long-term climate risks as a proactive adaptation intervention. Ensuring that warnings reach the most vulnerable and that they are able to understand and sufficiently resourced to act on them will increase their awareness of and reduce their exposure to climate risks, enhance both their absorptive and adaptive capacities, improve climate risk management and bolster community adaptation to climate change.
85. Lastly, these paradigm and operational shifts on the side of DOST-PAGASA, i.e. phenomenon-based to impact-based, products-based services to decision support services, meteorological threshold-based warning to impact threshold-based warning, and deterministic to probabilistic forecasting, will be accompanied by technological innovation in the form of a knowledge and decision support system that the project will develop. It will establish a high-performance computing infrastructure with big data analytics that provides enormous computational power to improve forecasting and warning services. This system will consist of tools and functionalities that will revolutionize the way forecasts and warnings are designed, communicated and distributed to end-users down the line. The knowledge and decision support system will use the latest technology to integrate the tasks of modelling and predicting severe weather events through to impact, generate ensemble prediction that allows more rapid and scientific-based comparison of multiple model forecasts, and provide a more robust estimate of uncertainties that will increase efficiency and effectiveness of impact-based forecasting and warning. Such scientific information will be visualized and disseminated in the form of user-friendly probabilistic hazard maps with accompanying impact tables and response tables usable to last-mile communities. This system will also integrate functionalities that are meant for disaster risk managers and decision makers at national and local levels by providing tools to visualize hazard and risk information in spatial format as well as enable users to store, organize and manage data required to assess risks and exposure of any target area. This will facilitate the conduct of risk assessment, the results of which can be used for local resilience planning and for mainstreaming risk information in local development planning and investment programming.

E.3. Sustainable development (max. 300 words)

86. The project has significant social, economic, environmental, as well as gender-sensitive development co-benefits. With the avoided loss of assets and livelihood sources, the project will help reduce loss of income and alleviate poverty in the project sites. It will also bring about sustained local economies as local economic production and exchanges are expected not to be significantly disrupted due to more strategic risk-informed local development planning and investment programming. Increased social cohesion will also be promoted as community-based initiatives are expected to provide venues for community discussions and collaboration. Further, the information generated by the system will help protect natural resources that serve as buffer to more adverse impacts of hazards and are livelihood sources of local communities. Lastly, gender and development strategies will be promoted and integrated to the interventions in order to contribute to identifying and addressing gender-based vulnerabilities in the project sites.



87. The project will also contribute to sustainable development in the country. The project supports the implementation of the Philippine Development Plan 2017-2022 in terms of the development of adaptive capacity of the public sector in anticipating risks from natural hazards and climate change impacts, strengthening of inter-agency coordination and linkages, development of climate and disaster responsive technologies and innovations, capacity development of local planners for multi-scenario analysis and climate change projections, development of capabilities and maximization of the use of core and emerging technologies for CCA, development, maintenance, and ensuring of accessibility of climate and geospatial information, establishment and promotion of innovation hubs on climate change and services, and identification of technological and research priorities and capacity needs on CCAM and DRRM.
88. The Philippines National Framework Strategy on Climate Change (2011-2028) identifies the need to establish climate information system and database, which is aligned with the outputs of the project. In the same vein, the National Climate Change Action Plan prioritizes the objective of the human security agenda, particularly to reduce the risks of women and men to climate change and disasters and the objective of enhanced knowledge on the science of climate change through enhancing the capacity for climate change adaptation and disaster risk reduction at the local and community level and establishing climate change knowledge management accessible to all sectors at the national and local levels are clearly supported by the project's outputs as well.
89. In terms of global policies and priorities for reducing climate-induced hazards and risks, the Sendai Framework for Disaster Risk Reduction or Sendai Framework endorses the use of multihazard EWS as a sound disaster risk reduction investment strategy and promotes the incorporation of disaster risk reduction in development and planning processes. One of the major goals declared in Sendai Framework is to "substantially increase the availability of and access to multi-hazard EWS and disaster risk information and assessments to the people by 2030," which is one of the project's main outputs. Target G specifically mentions that by 2030, substantial increase in the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people should be achieved. Further, Sendai Framework declares under Priority 3-Investing in disaster risk reduction for resilience that both national and local level government agencies must "(f) promote the mainstreaming of disaster risk assessments into land-use policy development and implementation, including urban planning, land degradation assessments and informal and non-permanent housing, and the use of guidelines and follow-up tools informed by anticipated demographic and environmental changes" and "(g) promote the mainstreaming of disaster risk assessment, mapping and management into rural development planning and management of, *inter alia*, mountains, rivers, coastal flood plain areas, drylands, wetlands and all other areas prone to droughts and flooding...."⁵² which are fully supported by the project. In this regard, by also incorporating risk assessment in development planning and establishing early action protocols, the project will help in the attainment of Target A: Substantially reduce global disaster mortality by 2030, aiming to lower the average per 100,000 global mortality rate in the decade 2020- 2030 compared to the period 2005-2015.
90. In terms of Sustainable Development Goals, the project is aligned with Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable, specifically target 11.5 which states that by 2030, number of deaths and number of people affected should be significantly reduced and direct economic losses relative to GDP be substantially decreased, including for water-related disasters, with a focus on protecting the poor and people in vulnerable situations. In addition, Goal 11.b aims to substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels by 2020. Further, the proposed project supports Goal 13: Take urgent action to combat climate change and its impacts, specifically target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; target 13.2: Integrate climate change measures into national policies, strategies and planning and target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. Impact-based forecast and warning services has also been identified as a high priority by the World Meteorological Organization (WMO) to increase the relevance and utility of forecasts and warnings.

E.4. Needs of recipient (max. 300 words)

91. **Vulnerability.** Located in the Pacific Ring of Fire and along the typhoon path, the Philippines is vulnerable to the impacts of natural hazards, which are intensified with the onset of climate change. The warm, equatorial waters power storms, about 20 typhoons per year, where low-lying coastal islands and coastal zones serve as

⁵² UNISDR. 2015. *Sendai framework for disaster risk reduction 2015–2030*. Geneva: UNISDR.



home to more than 60% of the population. Storm surges for landfall of Super Typhoon Haiyan reached 23 feet (7 meters) in some places, and were more than 16 feet (5 meters) high. Those waves rolled over low-lying parts of populated islands such as Leyte, home to the coastal city of Tacloban, where 10,000 people died. The long-term CRI indicates that in the 20-year period, the Philippines ranks on the top five countries. In addition, 60% of the country's total land area is exposed to multiple hazards and as a result, 74% of Filipinos are at risk. In an analysis of natural disaster hotspots by the Hazard Management Unit of World Bank, the Philippines is among the countries where large percentage of population reside in disaster-prone areas. Many highly populated areas are exposed to multiple hazards: 22.3% of the land area is exposed to three or more hazards and in that area, 36.4% of the population are exposed. Areas where two or more hazards are prevalent comprise 62.2% of the total area where 73.8% of the population are exposed. In 2017, economic losses due to 22 tropical cyclones, flashfloods, and intertropical convergence zones amounted to approximately USD 121 million, according to OCD-NDRRMC. The data does not include the cost of damage to private properties, commercial activities, and foregone revenues from the hundreds of people who died as a result of calamities. Lastly, in terms of Average Annual Loss (2017), or the expected loss per annum associated to the occurrence of future climate-linked hazards is estimated to be USD 7,158.73 M.

92. **Vulnerable Groups and Gender aspects.** There is a growing body of research illustrating the adverse impacts of storms and related flooding on women living in urban settings in both developing and developed countries. In the Philippines, post-typhoon vulnerability assessments found that female-headed households were more likely to be vulnerable to flooding and other storm-related impacts (343). After Typhoon Ondoy struck Manila, female-headed households experienced greater damage costs, while male-headed households experienced greater temporary loss of income, likely due to a reliance on manufacturing employment among men, which took longer to resume after the floods (*Gender and Climate Change:A Closer Look at Existing Evidence*). As mentioned earlier, the project will aid in integrating climate and disaster-risk considerations in local planning and programming to increase the communities' adaptive capacity.
93. **Economic and Social Development level of the country and affected population.** The Philippines is a lower middle income country and ranks 113th on the Human Development Index. Despite the recent economic growth, a substantial part of the population (22 million) still live below the poverty line. Despite the generally good economic performance, poverty remains high and the pace of poverty reduction has been slow. Latest data from the World Bank showed poverty decline in recent years, with 21.6% of Filipinos living below the poverty line in 2015, compared to 26.6% in 2006.
94. **Vulnerability of Project Sites.** The project will have a local level scope that will be implemented in four project sites: Tuguegarao City, Legazpi City, Municipality of Palo, and Municipality of New Bataan. The hazards for these four project sites were chosen based on historical data on their frequency and high level of impact in these areas. The following paragraphs summarize the vulnerability and risk of the project sites due to these hydrometeorological hazards.
95. Tuguegarao City in Cagayan Province is a third class component city in the Philippines with a population of 153,502 (2015 census) with 77,622 female and 75,880 male population. About one third of the population or 47,119 are considered highly vulnerable to hazards as these are aged 0-14 and over 65 years of age. It is the capital of the province of Cagayan and the regional and institutional center of Cagayan Valley (Region II). It composed of 49 villages of barangays and has a total land area of 144.80 km² with 30m elevation. Within the past three decades, its economy gradually shifted from agriculture to secondary/tertiary economic activities such as trading, commerce and services. The shift was ushered by Tuguegarao's role as the Regional Government Center and Center of Commerce in Northern Luzon. Based on the number of tropical cyclones (TCs) from 1951-2018 data of 1° latitude x 1° longitude square grid , a total of 66-110 TCs have crossed the province of Cagayan. Also, data on TCs with high wind speeds from 1971-2013 showed that extreme TCs have become slightly more frequent (Cinco et al., 2016). These events have caused a lot of damage and losses in Cagayan especially when it comes to rain-induced flood and severe wind impacts. Being the catch basin of the waters from different tributaries of Cagayan, is considered to be most vulnerable to flooding during the last few decades (Gannaban et.al., 2018). Yearly, the city's constituents, especially the farmer and those living near the riverbanks, suffer so much due to flashfloods. During the TY Haima, one of the most disastrous TY that stuck Cagayan, at least 1.5 million people were negatively affected (Gannaban et al., 2018). This has caused severe flooding which negatively influenced 10,100 households of the region. Damages to infrastructure is estimated around Php7 billion plus the reported damage to government infrastructure that has reached to P46 million (Cagayan PDRRMC). Since the intensity of a typhoon is being measured by its associated wind speed, Tuguegarao City was identified to be one of the vulnerable to severe wind impacts. In fact, based on the NDRRMC's situation report published during 16- 20 October 2016 (TY Haima), the following damages were



reported: 304,553 families or 1,386,587 persons were affected in 1,836 barangays in Region II of which 198,385 families; (899,397 persons) in 792 barangays are residents of Cagayan, and 136,324 houses (25,388 totally and 164,324 partially damaged) were damaged.

96. Legazpi City is composed of 70 barangays and is a first class component city and the capital of the province of Albay in the Philippines. It has a population of 196,639 (2015 census) broken down into 98,477 female and 98,192 male population. The children (60,779) and elderly (9,990) accounted for 70,769 of the total population. It has a total land area of 153.70 km² with 47m elevation. Legazpi is the regional center and largest city of the Bicol Region, in terms of population. In terms of TCs, Legazpi City has the same number of tropical cyclones with Cagayan as per 1951-2018 data. For the last 63 years, this city has been one of the areas most frequently hit by TCs which entered PAR. According to the study conducted by Japan International Cooperation, approximately 70ha get flooded 3-5 times per year by 1-day storm rainfall (~60mm/day). On the other hand, areas that are occasionally flooded are approximately 180ha where floods occur once a year by 3-day storm rainfall (~200mm/day). During Typhoon Durina (Reming), an accumulated 466 millimeters of rainfall for a 12-hour record (daily rainfall) on 30 November 2006 was recorded on the day the widespread debris flow occurred. It was 40 years ago when similar amount of rainfall was last recorded in the Province of Bicol. Typhoon Durian moved slowly over Legazpi and overwhelmed the area with rainfall intensity of 135 mm/hr (3:00pm hourly rainfall data). Per the 16 Dec 2006 report of the Bicol Provincial Disaster Coordinating Council (PDCC), 518 people died and some 648 missing, while 45,199 houses were partially damaged and 68,617 houses were totally damaged.
97. The Municipality of Palo is located in the north-eastern part of the province of Leyte with a population of 70,052 (2015 census) broken down into 34,082 female and 35,970 male population. Children numbered 23,340 while the elderly population was 3,132. Composed of 33 barangays, Palo was declared as 3rd class municipality in the province of Leyte, Philippines (citation). It has a total land area of 221.27 km² (85.43 sq mi) with 8.9m (29.3 ft) elevation. Unlike Cagayan and Legazpi City, province of Leyte has a lesser number of TC frequency based on 1951-2018 data. According to the 1° latitude x 1° longitude square grid, a total of 21-50 TCs crossed over the province. However, one the strongest typhoons that hit the Philippines, Haiyan, significantly devastated Eastern Visayas, particularly the provinces of Leyte and Samar in November 2013. Typhoon Haiyan was the world's strongest typhoon in 2013, with a maximum sustained wind of 235 kph and gustiness of 275 kph that brought devastation of catastrophic proportions in its wake where more than 90 percent of homes and infrastructures in Samar and Leyte were destroyed and communication cut off due to strong winds. Preparing for storm surges induced by tropical cyclones is one of the most important challenges that many coastal areas in the world are currently facing. During the same event (TY Haiyan), a large-scale devastation struck Leyte with strong focus in the Municipality of Palo and Tacloban. According to the latest report from the NDRRMC, the total numbers of dead and missing due to the typhoon were 6,300 and 1,061, respectively, as of 17 April 2014. Most of the casualties were reported in two islands: Leyte (5,402 dead and 931 missing) and Samar (492 dead and 74 missing). The damage was largely caused by high winds and storm surge and storm waves induced by the typhoon.
98. The Municipality of New Bataan, a small agricultural town of mostly farmers on banana plantations, is situated north and west of Davao de Oro province with a population of 47,726 with 22,544 female and 25,182 male population. There were 15,265 children and 2,346 elderly in 2015. The municipality is also home to two indigenous communities, namely, Mansaka and Mandaya, that inhabit the remote mountainous barangays of Cagan, Manurigai and Pagsabangan. At the time of this writing, there was no population data available on the indigenous communities. However, these three barangays had a total population of 5,431. The municipality is surrounded by mountain ranges and more than 50% of its territory is forest cover that has been the source of living for its residents. Composed of 16 barangays, New Bataan is a first class municipality with total land area of 553.15 km². Unlike the previous project sites, New Bataan was not regularly frequented by typhoons. However, the recent Typhoon Pablo (international name, Bopha), a total of 612 people died due to landslide brought about by the heavy rains caused by the typhoon. The high winds and heavy rainfall resulted in landslides in the hinterland. Barangay Andap was buried under a pile of rocks and boulders. Heavy rains brought by the typhoon caused flooding which carried eroded gravel, boulders, and other debris from the mountains which slid down to the community (Lagmay et al., 2013). According to the situation report by NDRRMC on 25 December 2012, a total number of 711,682 families/6,243,998 persons in 3,064 Barangays/318 municipalities / 40 cities / 34 provinces of Regions IV-B, VI, VII, VIII, IX, X, XI, XII, CARAGA and ARMM, of which New Bataan is situated, were affected. After the declaration of the State of National Calamity thru Proclamation No. 522, dated December 7, 2012, a total number of 4,567 (1,067 dead, 2,666 injured and 834 missing) casualties were reported with millions worth of damage to properties.



99. **Absence of alternative sources of financing.** The Government of the Philippines is committed to the improvement of its forecasting and climate information systems. However, budget constraints due to large investments in poverty alleviation and infrastructure, limit the resources available for other activities. As disasters strike more frequently, the cost of disaster response and mitigation also increases. But the national budget continues to lag behind, unable to meet the country's many competing needs. The composition of government expenditures, particularly the share of nonmandatory expenses, leaves little room for flexibility to allow a bigger impact on disaster spending. In the case of LGUs, they have varying disaster-related expenditure demands and revenue-raising capacities which are both affected by the incidence and severity of calamities that strike them.
100. While it cannot be denied that there have been significant innovations in the area of disaster preparedness and considerable amount of funds spent for the said phase, its various elements are continuously being challenged. Community participation and decentralization is ensured through the delegation of authority and resources to local levels, but existing financial constraints continue to affect the capacity of certain LGUs for effective disaster preparedness and response.
101. **Needs for strengthening institutions and implementation capacity.** To implement this proposed project, capacity development has to happen at various levels involving a variety of sectors and key institutions. A collective national capacity needs to be built to enable the country to address the climate change problem, especially its impacts. This national capacity building process has started at the national government level. However, those at the frontlines (LGUs, community leaders, and community-based organizations) have barely been capacitated. Their technical capacity and know-how have to be immediately placed at par with national actors. Local academic institutions and private sector actors also need increased competencies on climate change to be able to effectively support players at the local level.
102. The diversity of scientific expertise among partnerships will enable to address highly complex situations and help to ensure that work is completed efficiently to produce scientifically robust and practically relevant impact-based forecasting products. The value of working together as partners is not just in the development of products, services and research but also in the building of organizational and individual relationships and trust within the public sector, providing, among other things, a catalyst for innovation and growth. This will also strengthen the exchange of knowledge, ideas, expertise, intelligence and best practice in matters relating to natural hazards and provide a timely, common and consistent source of advice to government and emergency responders for civil contingencies and disaster response. This will provide a basis for the longer-term strategic view necessary for an effective national disaster risk platform.

E.5. Country ownership (max. 500 words)

103. The Government of the Philippines enshrines climate risk management and climate change adaptation as a top priority in its national development agenda and policies. This is evidenced by the 2019 General Appropriations Act of the Philippines which specifically highlights provisions in the budget for the establishment of a Multi-hazard Impact-based Forecasting and Early Warning Systems and the creation of Local Disaster Risk Reduction and Management Office in all LGUs. This national budget policy cements the commitment of the national government to elevate the country's capacities, resources and systems for a more effective climate and disaster risk management and climate change adaptation.
104. The project likewise aligns with the three components of DOST-PAGASA's Roadmap Towards a World Class Atmospheric/Meteorological-Hydrological Agency for 2018-2022: i) Enhancement of research and development capability through rationalized and integrated approach (including EWS; numerical modelling regional and other tools; enhanced forecast system for rain-induced landslides, systematic standardized verification scheme for long-range forecasting; and sectoral impact-based climate change scenarios); ii) Establishment of regional weather service centers through enhancement of weather/climate and related services and establishment of flood forecasting and warning sub-centers in strategic areas; and iii) Development of regional and international cooperation program through collaboration and linkages. The Roadmap was formulated in view of the enactment of the DOST-PAGASA Modernization Act of 2015.
105. As the demand for more accurate, timely and effective weather information increases, DOST-PAGASA is improving its resources to come up with a better understanding of meteorological, hydrological, and climatological phenomena that occur in the country. DOST-PAGASA is enhancing its weather monitoring and observing facilities through the densification of different weather observation networks to broaden its base for delivery of service to the countryside. The progression in scientific know-how will ultimately ensure better mitigation and adaptation strategies. These initiatives are embedded in its Strategic Plan for 2018-2022 which



outlines the collective efforts to sustain and help create a disaster and climate resilient nation. The Strategic Plan includes programs and projects identified in the DOST-PAGASA Modernization Program. This project will not duplicate any of these initiatives because the emergence of MH-IBF-EWS was not yet apparent at that time, and therefore no resources were allocated for transforming the way it operated from a hazard-based forecasting paradigm to an impact-based forecasting and warning system.

106. The project likewise aligns with the strategies and priorities identified for “Forecasting, early warning and disaster risk communication” and “Knowledge and Capacity Development” in the National Climate Change Action Plan (2011-2028) and National Framework Strategy on Climate Change (2010-2022) (see page 23, paragraph 61). The Philippines’ Intended Nationally Determined Contributions Communicated to the UNFCCC on October 2015 “strives to ensure that climate change adaptation and disaster risk reduction are mainstreamed and integrated into the country’s plans and programs at all levels. The path towards a low emission development will require climate resilience and improved adaptive capacity.” The project will produce outputs that will support the integration of climate risk management and adaptation in development policies and plans as well as enhance existing national and local resilience plans (i.e. DRRM plans, CCA plans) by the institutionalization of MH-IBF-EWS at national and local levels.
107. The project activities that address issues and concerns related to the last mile and role of end-users were developed in close consultation with national and local stakeholders and based on assessment of local contexts. Four stakeholders consultation workshops were conducted by DOST-PAGASA, LANDBANK and Climate Change Commission to delineate the scope of the project, identify the different stakeholder group and their respective roles and contributions to the project, solicit inputs in the development of the funding proposal, and assess the gaps and challenges in the existing forecasting and early warning systems in the country (See Annex 2a).
108. LANDBANK is the largest government financial institution, the official depository bank of the Philippine Government, and 4th biggest bank in the country. It has 403 branches and 44 lending centers covering all provinces of the country. LANDBANK has taken the lead in extending timely financial and development support to small farmers and fisherfolks, micro, small and medium enterprises, local government units, agri-infrastructure, agri-business, environmental projects, among others, which it considers its priority sectors.
109. The Climate Change Commission as the NDA and the LANDBANK as the DAE have been a part of the whole process of developing the funding proposal beginning with the Concept Note stage and first consultation with stakeholders. They have provided advice and technical support by participating in all the meetings and numerous discussions held by DOST-PAGASA together with Co-executing Entities, i.e. DENR-MGB, OCD, DILG and WFP. In view of the above, country ownership is strong as there is sustained engagement of key national government agencies and the project’s focus on community and public sector collaboration.

E.6. Efficiency and effectiveness (max. 1 page)

E.6.1. Estimated cost per t CO ₂ eq, defined as total investment cost / expected lifetime emission reductions (Mitigation only)	(a) Total project financing	US\$ _____
	(b) Requested GCF amount	US\$ _____
	(c) Expected lifetime emission reductions	_____ tCO ₂ eq
	(d) Estimated cost per tCO₂eq (d = a / c)	US\$ _____ / tCO ₂ eq
	(e) Estimated GCF cost per tCO₂eq removed (e = b / c)	US\$ _____ / tCO ₂ eq
E.6.2. Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund's financing, disaggregated by public and private sources (Mitigation only)	(f) Total finance leveraged	US\$ _____
	(g) Public source finance leveraged	US\$ _____
	(h) Private source finance leveraged	US\$ _____
	(i) Total Leverage ratio (i = f / b)	_____
	(j) Public source leverage ratio (j = g / b)	_____
	(k) Private source leverage ratio (k = h / b)	_____

**F. ANNEXES****F.1. Mandatory annexes**

- Annex 1a NDA No-objection Letter(s)
- Annex 2a Pre-feasibility study (including Theory of Change, project/programme-level log frame, timetable, map, and summary of stakeholder consultation and engagement plan)
- Annex 3a Budget plan that provides breakdown by type of expense (Template in excel sheet)
- Annex 3b Co-financing from DOST-PAGASA
- Annex 4 Gender assessment and action plan (Template)
- Annex 5a DOST-PAGASA Co-financing commitment letter
- Annex 5b WFP commitment letter
- Annex 5c MGB commitment letter
- Annex 5d DILG commitment letter
- Annex 5e OCD commitment letter
- Annex 5f Legazpi City LGU commitment letter
- Annex 5g Tuguegarao City LGU commitment letter
- Annex 5h Palo LGU commitment letter
- Annex 5i New Bataan LGU commitment letter
- Annex 6 Term sheet and evidence of internal approval
- Annex 7 Risk assessment and management (Template)
- Annex 8 Procurement plan (Template)

G.2. Other annexes to be submitted when applicable/requested

- Annex 9 Legal due diligence (regulation, taxation and insurance)
- Annex 10 WFP Baseline Assessment and Case Study Development on Financing for Early Actions on Climate Risks in the Philippines
- Annex 11 Philippines Forecast-based Financing Lessons Learned (2015-2017)
- Annex 12 4th National Dialogue Platform on Forecast-based Financing
- Annex 13 DOST-PAGASA Information Flow
- Annex 14 Country Assessment Report for the Philippines
- Annex 1b AE Letter to GCF for the MH-IBF-EWS Funding Proposal
- Annex 2b Focus Group Discussion on Early Financing and Early Action Protocols and 4th Stakeholder Consultation Workshop on MH-IBF-EWS
- Annex 2c JICA Study on the Impacts of Climate Change upon Asian Coastal Areas: The case of Metro Manila
- Annex 2d Operation and Management Plan
- Annex 2e 2019 Philippine General Appropriations Act – Climate Change-Related Provisions

* Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.

No-objection letter issued by the national designated authority(ies) or focal point(s)



17 June 2019

YANNICK GLEMAREC
Executive Director
Green Climate Fund Secretariat
Republic of Korea

Dear Mr. Glemarec:

RE: FUNDING PROPOSAL BY LAND BANK OF THE PHILIPPINES REGARDING MULTI-HAZARD IMPACT-BASED FORECASTING AND EARLY WARNING SYSTEM FOR THE PHILIPPINES

We refer to the project Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines in the Philippines as included in the funding proposal submitted by Land Bank of the Philippines (LBP).

The undersigned is the National Focal Point and duly authorized representative of the Climate Change Commission (CCC) as the National Designated Authority to the GCF of the Philippines.

Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we communicate our no-objection to the project as included in the funding proposal, in that:

- a. The Government of the Philippines has no-objection to the project as included in the funding proposal;
- b. The project, as included in the funding proposal, is in conformity with Philippines' national priorities, strategies and plans; and
- c. In accordance with the GCF's environmental and social safeguards, the project, as included in the funding proposal, is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the project, as included in the funding proposal, has been duly followed.

We acknowledge that this letter will be made publicly available on the GCF website.

Very truly yours,


RACHEL ANNE S. HERRERA
Commissioner, Climate Change Commission

cf: Ms. Emellie Tamayo
Acting Vice President Lending Program Management Group, LBP

Mr. Prudencio Calado
Acting Asst. Vice President Environmental Program and Management Department, LBP

S U R V I V E # 1 • 5 C T H R I V E

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Environmental and social safeguards report form pursuant to para. 17 of the IDP

Basic project or programme information	
Project or programme title	Multi-Hazard Impact-Based Forecasting and Early Warning System (MH-IBF-EWS) for the Philippines
Existence of subproject(s) to be identified after GCF Board approval	[No]
Sector (public or private)	Public
Accredited entity	Land Bank of the Philippines (LANDBANK)
Environmental and social safeguards (ESS) category	Category C
Location – specific location(s) of project or target country or location(s) of programme	Philippines Tuguegarao City, Cagayan Legazpi City, Albay Palo, Leyte New Bataan, Compostela Valley/Davao de Oro
Environmental and Social Impact Assessment (ESIA) (if applicable)	
Date of disclosure on accredited entity's website	Monday, October 7, 2019
Language(s) of disclosure	[]
Explanation on language	[]
Link to disclosure	[]
Other link(s)	[]
Remarks	[An ESIA consistent with the requirements for a Category A project is contained in the “__”.]
Environmental and Social Management Plan (ESMP) (if applicable)	
Date of disclosure on accredited entity's website	N/A
Language(s) of disclosure	[]
Explanation on language	[]
Link to disclosure	[]
Other link(s)	[]
Remarks	[]
Environmental and Social Management (ESMS) (if applicable)	
Date of disclosure on accredited entity's website	N/A
Language(s) of disclosure	[]
Explanation on language	[]
Link to disclosure	[]
Other link(s)	[]
Remarks	[]
Any other relevant ESS reports, e.g. Resettlement Action Plan (RAP), Resettlement Policy Framework (RPF), Indigenous Peoples Plan (IPP), IPP Framework (if applicable)	
Description of report/disclosure on accredited entity's website	N/A
Language(s) of disclosure	[]
Explanation on language	[]
Link to disclosure	[]

Other link(s)	[]
Remarks	[]
Disclosure in locations convenient to affected peoples (stakeholders)	
Date	N/A
Place	
Date of Board meeting in which the FP is intended to be considered	
Date of accredited entity's Board meeting	Monday, June 17, 2019
Date of GCF's Board meeting	Tuesday, November 12, 2019

Note: This form was prepared by the accredited entity stated above.

Secretariat's assessment of SAP010

Proposal name:	Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines
Accredited entity:	Landbank of the Philippines (LANDBANK)
Country/(ies):	Philippines
Project/programme size:	Small

I. Summary of the Secretariat's assessment

1. The funding proposal is presented to the Board for consideration with the following remarks:

Strengths	Points of caution
Proposal has a strong climate science basis – Intergovernmental Panel on Climate Change approach to establishing “reasons for concern” (climate risk) is well articulated. Interventions align with GCF strategic objectives, Paris Agreement, Sustainable Development Goals and Sendai Framework, and seek to address urgent needs of at-risk communities.	
Proposal has strong country ownership and targets needs of recipients to build acute national institutional capacity gaps in design and implementation of impact-based forecasting. The proposal has the potential to shift paradigm through the adoption of innovative approaches to climate risk management, such as: 1) multi-hazard impact-based forecasting; and 2) forecast-based financing (actions).	This is the first time that impact-based forecasting and forecast-based financing are being implemented on such a scale in the country. Active engagement of GCF to support oversight of the project during implementation would be needed.
Due to the unique context of the project, it has the potential to provide valuable lessons and best practices that could inform future programming globally	

2. The Philippines is one of the world's most vulnerable countries to hydrometeorological hazards, with an average of 19 tropical cyclones annually. This was evident in 2013 when Typhoon Haiyan caused infrastructure and agriculture damages of USD 760 million, claimed 6,293 lives, injured 28,689 individuals and left 1,061 individuals unaccounted for. Studies project an increase in the intensity of tropical cyclones; and the increasing vulnerability of physical and social infrastructure means associated disasters are anticipated to be devastating without efficient and effective interventions. Lessons from Haiyan indicate that although forecasts and warnings may be accurate, the lack of understanding of risk information and its potential impacts remains a challenge. Actionable risk information, warnings and response actions are key to effectiveness and efficiency of early warning systems (EWS). This is the innovative solution that the funding proposal seeks to establish by building on lessons, best practices and state-of-the art multi-hazard, impact-



based forecasting EWS (MH-IBF-EWS) that will be linked with forecast-based actions to maximize impacts on the ground.

3. The proposal scales up current initiatives on disaster risk reduction and climate change adaptation in the Philippines. Focusing on transforming the current system of hydrometeorological warning service and climate risk information, the project aims to provide a proactive and people-centred MH-IBF-EWS. Aside from national-level activities, the project will also focus on four climate-vulnerable project sites and their respective hazards: (1) Tuguegarao City in Cagayan Province – for severe wind and floods; (2) Legazpi City in Albay Province – for severe wind and floods; (3) Municipality of Palo in Leyte Province – for severe wind and storm surges; and (4) New Bataan in Davao de Oro Province – for severe wind and landslides. These areas contend with high impact hazards but have limited resources. The proposed interventions are based on addressing the immediate needs of the populations as well as their long-term adaptation goals by focusing on core issues of vulnerability.

4. The four main outputs of this project are as follows: (1) generating science-based multi-hazard weather and climate risk information; (2) establishing MH-IBF-EWS supported by a knowledge and decision support system; (3) improving national and local capacities in implementing a people-centred MH-IBF-EWS and forecast-based early actions and (4) mainstreaming climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalizing a people-centred MH-IBF-EWS in the Philippines. These outputs are to be co-executed by the Department of Science and Technology – Philippine Atmospheric Geophysical and Astronomical Services Administration (DOST-PAGASA), which will take the overall leadership role; the Department of Environment and Natural Resources – Mines and Geosciences Bureau (MGB); the Department of Interior and Local Governance (DILG); the Office of Civil Defence (OCD), which will lead efforts in disaster management; the World Food Programme (WFP); and the local government units (LGUs) of the four project sites.

5. Outputs 1 and 2 establish the MH-IBF-EWS supported by a knowledge support system (output 1) and decision support system (output 2) focused on hazards, floods, landslides, severe wind and storm surges as well as heavy rain and severe wind for the local and national systems, respectively. Output 1 is implemented through eight activities (activities 1.1-1.8). It will begin with the upgrading of the observation networks in the project sites (activity 1.1) coupled with conducting technical analyses of historical meteorological events to establish threshold values (activity 1.2) to underlay the information needed for hazard maps, hazard model forecasts, *barangay* (village-level) exposure databases, socioeconomic and gender vulnerabilities, and building/structure fragility curves (activities 1.3–1.8).

6. Output 2 is implemented through six activities, resulting in the availability and accessibility of impact-based warnings for end users. Output 2 uses the information generated from output 1 to develop an MH-IBF-EWS (activity 2.1) for each hazard. This system includes a risk matrix, institution-verified early warning protocols (activity 2.2), and community-verified impact tables and response tables (activity 2.4). These will be used to inform the national policy framework on MH-IBF-EWS (activity 2.3). New visual and mapping tools will be created to communicate the web-based knowledge and decision support system to both the public and policymakers, who have different end user needs (activity 2.5). For example, specialized products will be created for policymakers who will benefit from the risk assessment tools for both immediate disaster management needs and long-term resilience goals. The system will be regularly calibrated and tested (activity 2.6).

7. Outputs 3 and 4 will focus on the enabling environment for long-term risk reduction. Output 3 interventions aim to develop coordination and technical capacities of relevant institutions in six activities. Beginning with a gap assessment of end users (activity 3.1), the project's executing entities (EEs) will undergo a needs analysis with gender-sensitive considerations (activity 3.2) to better inform the subsequent activities, including the development of climate risk-informed early action protocols (activity 3.3), and shock-responsive social protections will be developed for each

hazard at certain impact levels relevant to the project sites (activity 3.4). Public-facing knowledge products and information, education and communication (activity 3.5) will be rolled out nationwide for larger outreach and advocacy across different stakeholders (activity 3.6). This will be complemented by output 4, which intends to mainstream climate risk information and MH-IBF-EWS in key development policy and planning, investment programming and resilience planning at national and local levels in three activities, aiming to enhance existing reference materials (activity 4.1), coordination mechanisms (activity 4.2) and multi-stakeholder partnerships (activity 4.3).

8. In summary, the project aims to improve decision-making in climate risk management in the context of the broader development goals. The combination of evolving hazard data supports the rapid identification of exposed assets and provides a powerful workflow for forecasting social and environmental risks. Forecasting impacts will then be better understood by those at risk and those responsible for mitigating risk so that they can prepare and take appropriate early actions. An informed population that fully understands what a hazard will do is more likely to take the necessary actions that protect lives and livelihoods.

9. The proposal is requesting USD 9.99 million in GCF grant financing. The Government of the Philippines will provide co-financing of USD 10.19 million in the form of budget reallocation for the purchase of related equipment and software for outputs 1 and 2. The total project size is USD 20.18 million. In terms of environmental and social safeguards (ESS), this proposal has been categorized as a category C project. The review by the Secretariat confirms the environmental and social risk category assigned by the accredited entity (AE). Please refer to the ESS findings section for more information. The project duration is five years.

10. The Board may wish to consider approving this funding proposal with the terms and conditions listed in the respective term sheet and addendum XVII, titled "List of proposed conditions and recommendations".

II. Assessment of performance against investment criteria

2.1 Impact potential

Scale: N/A

11. The proposal, through outputs 1 to 4, aligns with the objective of GCF to promote the paradigm shift towards low-emission and climate-resilient development pathways and the fund-level impact of increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions (A1); and outcomes measured by GCF indicators (A6 - Increased generation and use of climate information in decision-making; A5 - Strengthened institutional and regulatory systems for climate and gender-responsive planning and development; and A8 - Strengthened adaptive capacity and reduced exposure to climate risks).

12. The proposal provides a comprehensive climate change assessment (on hazards, vulnerability, impact, exposure, and risks) at both project and national scales that has been conducted and outlined in the feasibility studies (annex 2 of the funding proposal). It proposes to increase resilience of communities to climate risks by reducing the loss of lives, livelihoods and assets. The direct beneficiaries of the project (under outputs 1, 2 and 3 at the national level) are estimated at 467,919 individuals (i.e. Tuguegarao City, 153,502 individuals; Legazpi City, 196,639 individuals; New Bataan, Compostela Valley, 47,726 individuals; and Palo, Leyte, 70,052 individuals) based on the 2015 census. The indirect beneficiaries, a total of 8,040,935 individuals, will benefit from receiving impact-based forecasts for effective preparedness and response: they include the populations living in the Cagayan Valley River Basin (i.e. the provinces of Cagayan, Apayao, Kalinga, Mountain Province, Ifugao, Isabela, Nueva Vizcaya, Quirino and Aurora) with 3,601,484 people; Albay Province with 1,314,826 people; Compostela Valley with 736,107 people; and Leyte province with 2,388,518 people. Additionally, the improved weather forecasts that will be generated by the project will indirectly benefit the total national population of 101.7 million as a



national public good. The project will benefit about 50 per cent of women and 33 per cent of children.

13. The proposal will benefit from a detailed analysis of beneficiaries disaggregated at the community level based on the demographics. This could be undertaken prior to project inception to help shape implementation. Implementation of interventions is anticipated to be completed within the proposed times, however, some level of risk exists, such as interruptions from tropical cyclones, which may impact implementation in some of the isolated communities. Local experience indicates the possibility of putting in place mechanisms to reasonably mitigate such risks. The systems and processes will require continuous updates and integration into the broader national infrastructure during and after the project cycle as new technologies, data and knowledge become available. Infrastructure lock-in is not envisaged due to the nature of the types of infrastructure and interventions to be implemented given that the sites are developing urban centres and municipalities.

14. In summary, the interventions are well suited to address the national challenges identified and are fully aligned with the nationally determined contribution and Sendai Framework targets of: (a) substantially reducing national disaster mortality aiming to lower the average per 100,000 national mortality rate compared to the period 2005–2015; (b) substantially reducing the number of affected people nationally, aiming to lower the average figure per 100,000 compared to the period 2005–2015; (c) reducing direct disaster economic loss in relation to national gross domestic product; (d) substantially reducing disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience.

2.2 Paradigm shift potential

Scale: N/A

15. The proposal provides a well-articulated theory of change that details elements of the proposed interventions. It proposes to build on lessons from past disasters (e.g. Typhoon Haiyan), such as those related to increasing typhoon intensity and societal losses. It proposes to introduce a new approach that accurately estimates impacts and multi-hazards, and to establish an end-to-end EWS for the key hazards of tropical cyclones, floods, landslides and storm surges.

16. The proposed approach adopts the best available science and technology developed by the World Meteorological Office (WMO), United Nations Office for Disaster Risk Reduction and humanitarian agencies to establish an MH-IBF-EWS consisting of impact-based forecasting and forecast-based actions. Frontier research and pilots with this approach have shown significant reduction in disaster risks, including post-disaster poverty reduction and improved well-being. Establishment of a high-performance computing infrastructure with big data analytics as indicated in output 1 could provide enormous computational power to improve the performance of forecasts, planning and response capability. The proposed resolution of 1.5 km provides better impact forecasting than the 2 km recommended threshold.

17. The proposal has also articulated a detailed climate change assessment based on the Intergovernmental Panel on Climate Change and WMO Commission on climatology recommended approaches to strengthen the climate science basis of the proposal (annex 2 of the funding proposal). Adopting a probabilistic approach to a range of possible scenarios instead of a traditional deterministic approach leads to better forecast performance and actionable warnings for effective disaster risk reduction. Establishing an ensemble forecasting system greatly increases the robustness and utility of the forecasts as it provides a range of possibilities for decision-making. The system will also increase the lead time to allow space and time for better planning and responses. The proposal will introduce improved computational resources and knowledge that will enable high-resolution forecasts/warnings at the intervention scale, accurately capturing the spatio-temporal details of extreme events, hazards and impacts. Significant reduction in errors



compared to traditional systems (the baseline) will lead to efficient interventions that will secure lives, livelihoods and assets.

18. The proposal builds on best practices and lessons of past successful projects to develop and implement the project. Conceptually, it shows a significant shift from traditional thinking, and it is envisaged that this will lead to maximization of impacts on the ground through indicators aligned to the Paris Agreement and Sustainable Development Goals (SDGs). The proposal indicates it will support the implementation of the Philippine Development Plan 2017–2022 by developing the adaptive capacity of the public sector to anticipate multi-hazard risks and impacts by strengthening inter-agency coordination and capacity of local planners. The proposal is also fully aligned with the four priorities of the Sendai Framework: (priority 1) understanding disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment; (priority 2) strengthening disaster risk governance to manage disaster risk; (priority 3) investing in disaster risk reduction for resilience through public and private investment to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment; and (priority 4) enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

19. This will be the first time an in-depth implementation at scale of impact-based forecasting and forecast-based action in the Philippines using state-of-the-art, high-performance computing infrastructure, data analytics and impact-based forecasting. The uniqueness of the Philippines in terms of the complexity of the population, geography, frequency and increasing intensity of annual disaster trends presents an opportunity for this proposal to provide best practices and lessons for replication (and inform future programming) beyond the Philippines (at a global scale). This will initially inform implementation of similar ongoing GCF projects in other regions and countries as well as those under development.

20. The Philippines has extensive experience in disaster management and has built strong global partnerships. However, due to the complexity of deploying impact-based forecasting and forecast-based financing in a complex geography and high population centres, the proposal will benefit from deepening existing partnerships with the international community as well as strong oversight of project implementation.

2.3 Sustainable development potential

Scale: N/A

21. The long-term climate risks index in the 20-year period places the Philippines among the top five countries. About 60% of the total land area is exposed to multiple hazards putting 74% of the population at risk from multiple hazards (areas where two or more hazards are prevalent comprise 62.2% of the total with 73.8% of the population exposed). The 2017 economic losses due to 22 tropical cyclones, flash floods, and intertropical convergence zones is estimated at USD 121 million (OCD-NDRRM).

22. The proposal provides examples of the costs and benefits of early action in similar projects and contexts. A JICA study on flooding in Metro Manila show that integrating climate risk management considerations in infrastructure planning (1990 Master Plan) will lead to significant reduction in damages. Damages due to inaction under A1FI climate scenario could be up to 24% of Gross Regional Domestic Product (GRDP) for 100-year flooding conditions whereas implementation of the 1990 Master Plan under B1 climate scenario would be about 9% of GRDP. The estimates for a 30-year return period are 15% and 3% of GRDP respectively.

23. A World Meteorological/WorldBank global study on the utility of climate information and early warning systems show that on average a USD 1 investment returns USD 2 to USD 36. A United Nations Children's Fund/WFP “Return on Investment for Emergency Preparedness” study found that pre-positioning of emergency supplies can yield returns on investments of 1.6 to 2.0 and generate significant time savings in response of between 14 and 21 days on average.



24. The proposal (Activity 1.1) seeks to undertake the installation of observation networks across the project sites and to enable, to a greater extent, in situ measurements of climate and environmental parameters that, blended with other socioeconomic data (risk database), can be used to quantify and track impact indicators for monitoring, reporting and verification processes. In addition, the installations will contribute to the global basic observational network that would increase performance of global forecasts (e.g. hurricanes, El Niño) as well as the downscaled local forecasts providing an essential national and global public good.

25. The proposal indicates co-design and co-production of interventions by actively engaging both communities that are at risk and local decision-makers in crafting warnings and planning early actions during the “window of anticipation”. These local-level activities will scale up initiatives on forecast-based early actions, including forecast-based financing.

26. The avoided costs from implementation of the proposed impact-based forecasting and forecast-based actions could unlock the potential to significantly reduce disaster risk in communities where the private sector and government do business thereby securing livelihoods, critical infrastructure and valuable assets. The proposal has a strong capacity development component that will strengthen the knowledge of key institutions (government, private entities and communities) and awareness of climate risk reduction strategies among the broader population. It proposes to support disaster risk reduction by promoting integration of climate- and disaster-risk considerations in local planning and programming to increase the adaptive capacity of communities.

27. In terms of indirect benefits, the proposed impact-based forecasts to be provided for specific sectors could lead to better planning and avoided cost through: (1) transport sector – reduction of traffic/cars on the road at specific times and indirectly reducing emissions from transport and improving air quality and environmental health; and (2) agriculture and waste management sectors – reduction in greenhouse gas emissions using agro-meteorological and air quality forecasts to inform agricultural/land management practices (e.g. rice) and waste management practices.

28. The proposal (through outputs 1 to 4) responds to the Paris Agreement (Article 7, paragraph 7(c)), which calls for “Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and EWS, in a manner that informs climate services and supports decision-making”, as well as decision B.07/04, paragraph (b)(iii)(3), which calls for “increased generation and use of climate information in decision-making”. The proposal is fully aligned with the SDG target 13 on climate action by seeking to: (13.1) strengthen resilience and adaptive capacity to climate-related hazards and natural disasters; (13.2) integrate climate change measures into national and subnational policies, strategies and planning (including a national adaptation plan, nationally determined contribution, national communication, national development plan and disaster management plans); (13.A) mobilize resources through both internal and external partnerships towards implementation of the Paris Agreement as evidenced through the co-financing and other means for the successful implementation of the project; (13.B) promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities.

29. The proposal makes the case that while damages to property and livelihood are important, the human cost of disasters remains the main priority in the Philippines. With more than 20,000 deaths in 2000-2016 and damages amounting to a total of nearly USD 20 billion, it is imperative to scale up measures to increase the level of preparedness, particularly in vulnerable communities. The proposed forecast-based actions (FbA) with the introduction of a people-centered MH-IBF-EWS would be a significant step towards addressing disaster risk in the Philippines.

30. The proposal will benefit from exploring how it could leverage opportunities from the population groups as a strategy to optimize demographic dividends and the impacts of interventions on the ground. This could be done during project implementation.

2.4 Needs of the recipient

Scale: N/A

31. As a lower middle-income country, ranking 113th on the Human Development Index, located in the Pacific Ring of Fire and along a typhoon path, the Philippines is vulnerable to the impacts of natural hazards, which are intensified with the onset of climate change. The warm, equatorial waters power storms, about 20 typhoons per year, where low-lying coastal islands and coastal zones serve as home to more than 60 per cent of the population. Storm surges for landfall of Typhoon Haiyan in 2013 reached 7 metres in some places and were more than 5 metres high. Those waves rolled over low-lying parts of populated islands such as Leyte, home to the coastal city of Tacloban, where 10,000 people died. The Philippines has a substantial population of 22 million living below the poverty line.

32. The proposal has articulated these needs well, as outlined in the nationally determined contribution, national adaptation plan and national development plan as well as connecting them to the SDG and Sendai Framework as indicated in previous sections of the investment criteria. The proposal has undertaken an extensive vulnerability assessment of the project sites (Tuguegarao City, Legazpi City, Municipality of Palo, and Municipality of New Bataan) and developed interventions that could adequately address the challenges outlined in the proposal.

2.5 Country ownership

Scale: N/A

33. The proposal is well-aligned with the NDC, SDG and national development plans. It states that the Government has prioritized climate risk management and climate change adaptation in its national development agenda and policies. This is evidenced through the 2019 General Appropriations Act of the Philippines, which specifically highlights provisions in the budget for the establishment of a MH-IBF-EWS and the creation of Local Disaster Risk Reduction and Management Offices in all LGUs. This national budget policy shows the commitment of the Government to elevate the country's capacities, resources and systems for more effective climate and disaster risk management and climate change adaptation.

34. As a Government-owned, universal licensed bank of the Philippines, Landbank focuses on serving the needs of the farmers, fishermen and underserved communities that constitute the groups most vulnerable to impacts of climate risks. It has an extensive rural network (365 branches and 1,607 automated teller machines) and services many rural sector clients in areas where banking is either limited to rural banks or is non-existent.

35. Landbank has extensive experience in the implementation of a wide range of projects locally, including as a fund manager with oversight from other government institutions. It has the relevant experience to implement the proposed project and could leverage additional expertise from the wide range available from the partner institutions and co-EEs of the project. Implementation risks are further outlined under the project risk analysis section of the assessment. The project has well-articulated implementation arrangements outlining responsibilities of parties and a well-structured project management architecture.

36. The proposal has been designed with active participation of all the stakeholders (including civil society organizations) and implementation is envisaged to be managed transparently with all stakeholders. More importantly, the proposal has been developed mainly using local expertise and knowledge with minimal inputs from international partners.

2.6 Efficiency and effectiveness

Scale: N/A

37. The financial structure for the proposal is justified for a highly vulnerable country (climate risks, financial and economic situation) and a priority adaptation intervention. GCF grant financing is appropriate because the project is not revenue generating, and the outputs generated will be public goods. The proposal provides a co-finance ratio slightly above the GCF contribution (about

1:1). Although the outputs from the project will have characteristics of public goods, additional financing modalities for sustainability could be explored (e.g. corporate social responsibility, results-based payments). The proposal also provides an exit strategy through commitment from the Government to cover operation and maintenance costs as part of its long-term budget planning and allocation processes. It indicates that the investment will be part of existing infrastructure, systems and processes that are prioritised in the national development and budgeting plans and endorsed at the highest level of decision-making.

38. The resources that the proposal has mobilized should be enough to implement the envisaged interventions. The institutions that will be involved in the implementation of the project have the needed experience but will need capacity strengthening (particularly the LGUs, community leaders, and community-based organizations) during and beyond the project lifecycle. Institutional capacity gaps could be sufficiently addressed through the strong partnership that the proposal has established with renowned international institutions such as the United Kingdom Met Office, WMO and WFP.

39. The proposal will benefit from further assessments (e.g. impact evaluation) for the project sites during project implementation to comprehensively quantify the net benefits of the interventions. Additionally, it should explore potential sources of national climate funds (e.g. private sector investments) that could be mobilised to sustain and scale up the investments. This could be done during project implementation.

III. Assessment of consistency with GCF safeguards and policies

3.1 Environmental and social safeguards

1. Does the project comply with the GCF Environmental and Social Policy?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
2. Does the project have minimal to no ESS risks compatible with SAP?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

3.1.1. Environmental and social risk category

40. The AE has screened the project as likely to have low or minimal environmental and social risks and potential impacts, equivalent to category C. The AE provided information on its screening of environmental and social risks of the project. The AE is requested to provide a rationale for the assigned environmental and social risk category. The due diligence by the Secretariat confirms the low or minimal environmental and social risk category assigned by the AE.

3.1.2. Environmental and social assessment

41. The activities that will be undertaken by the project include installation of hydrometeorological equipment, capacity development and analyses to contribute to an EWS. The project's activities are not expected to result in any moderate to significant negative environmental or social impacts, and potential environmental and social impacts that may be generated have low or minimal risk.

3.1.3. Environmental and social risks and impacts

42. The environmental and social co-benefits will result from access to information generated by an EWS that will assist communities and authorities to mitigate any adverse impacts of weather-related hazards, thereby protecting livelihoods, assets and natural resources. The installation of hydrometeorological equipment will be done on existing sites belonging to PAGASA, the EE, and within local government-owned properties; therefore, the project will not result in land acquisition.

Potential environmental and social risks include minimal and temporary noise and air pollution as well as limited removal of vegetation that may result from the installation of early warning equipment by the project. The AE has proposed measures to ensure a safe and healthy work environment for any workers involved.

3.1.4. Stakeholder engagement

43. Consultations were undertaken in 2019 by the AE during the preparation of the project. The stakeholders involved included mainly national government agencies, local government authorities and implementing partners. Issues raised in consultation meetings included communication among different stakeholders and access to information on the implementation of the project, including concerns and achievements. To address these issues, the AE provided a stakeholder engagement plan in the report on the feasibility study. The plan has outlined stakeholder engagement strategies that can be used by the project during its implementation for continuously engaging stakeholders including end-users at the community level.

3.1.5. Grievance redress mechanism

44. The AE provided the procedure and contact details for its institutional-level grievance redress mechanism. At the project level, the EE will be required to establish its own grievance redress mechanism and ensure that it is implemented. The AE is required to ensure that the project-level grievance redress mechanism is communicated to stakeholders.

3.1.6. Comments on indigenous peoples

45. The project beneficiaries include Mansaka and Mandaya villagers in the Municipality of New Bataan. The project is not expected to have moderate or significant adverse impacts or risks to their lands and resources. The funding proposal acknowledges the importance of developing multi-hazard EWS and responding to the needs of vulnerable communities; it proposes innovation in “combining the best available science and local knowledge on probabilistic hazard mapping, modelling and forecasting and risk assessment”. To achieve this, and also to enhance communities’ uptake and implementation of the EWS, including in New Bataan, it is recommended that the AE and EE include indigenous knowledge experts in project implementation. These experts can enhance full participation and inclusion of communities’ knowledge, priorities and decision-making processes in the face of weather-related hazards.

3.2 Gender policy

3. Does the project comply with the GCF Gender Policy?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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46. The AE has submitted a gender assessment; therefore, it complies with the operational guidelines of the GCF Gender Policy and Action Plan. It has also provided a programme-level gender action plan. The AE already knows the specific project sites, but it still needs to undertake a context-specific project-level gender assessment and action plan. Consultation has taken place in just one of the locations though further consultations are expected to take place at the beginning of the project.

47. The gender assessment that was conducted describes the gender issues at the country level and indicates the existence of a national policy environment, supportive legislation and practices to promote gender equality. The assessment indicates that in the Philippines, women exceed men in educational attainment and the country ranks high in equality between women and men, according to the gender development index. However, the assessment also indicates that there are gender inequalities in parliamentary seats held by women (29.1 per cent) as well as female labour force participation in the market, which stands at 49.6 per cent for women against 75.1 per cent for men.

The AE has presented information on the legal system showing the positive strides taken by the Government to ensure women and men are progressing equally.

48. Initial sex-disaggregated data for population and age have been shared. Information on indigenous peoples and the devastation and effects on people in the project sites of Tuguegarao City in Cagayan, Legazpi City, the Municipality of Palo have been identified. As indicated in paragraph 45 above, context-specific assessments and action plans will be developed. The gender assessment has indicated some gender and social issues that it expects to be included in the project. The AE will conduct stakeholder consultations to identify and affirm the gender and social issues as they relate to the project objective while the AE will ensure capacity is built within existing institutions and systems to ensure a gender-responsive approach is undertaken in project activities. The stakeholder consultations that the AE will undertake will look into:

- (a) Issues of access to accurate weather information for women and men, including indigenous peoples, the elderly, persons with disabilities, and female heads of households;
- (b) Channels/modes of communication and the effectiveness of information that is disseminated to the end users;
- (c) The level of understanding of information being communicated by different community members;
- (d) The kinds of information required based on roles and responsibilities played by women and men;
- (e) The ability of women and men to take action and respond to early warnings; and
- (f) The integration of gender and women's concerns in policies and programmes on early warning and early actions.

49. The programme-level gender action plan provided outcome statements, such as increased generation and use of climate information in decision-making for women and men; strengthened institutional and regulatory systems for climate and gender-responsive planning and development; and a third outcome statement of strengthened adaptive capacity and reduced exposure to climate risks for women, men and at-risk communities. The programme-level gender action plan also describes interventions that contribute to achieving the outcome statements, such as accessible EWS for the general public that mainstream gender issues in MH-IBF-EWS; strengthening the capacity of stakeholders in gender-responsive disaster risk reduction; encouraging the equitable participation of stakeholders in gender training for project staff and personnel of partner agencies; and conducting gender-sensitive vulnerability assessments in the project sites.

50. The action plan also provides timelines and identifies responsible entities for its implementation, and it is indicated in the assessment that there will be a gender expert supporting implementation and capacity development throughout the project implementation. However, the action plan does not provide corresponding targets, indicators and budgets for the implementation of the activities. It also does not indicate if a revised action plan will be submitted once the assessments have been done that confirms the specific activities that will be undertaken with corresponding baselines, indicators, targets and budgets.

3.3 Risks

3.3.1. Overall proposal assessment (medium risk)

51. GCF is requested to provide a grant of USD 9.99 million to improve MH-IBF-EWS. The project will upgrade existing systems and coordinate with previous initiatives funded by other donors and will leverage the lessons learned. The Government is providing co-financing of USD 10.1 million as in-kind contribution; there is no co-financing by the AE. The project involves various implementation partners in addition to the executing entity (EE). The AE has proposed entire grant

financing from GCF based on the non-revenue generating nature of the activities, budget constraints due to large investments in poverty alleviation and infrastructure, and the status of the country as a lower middle-income country. However, the country's sovereign credit rating has been upgraded recently by Standard & Poor's, reflecting the country's above-average economic growth and sustainable public finances.

3.3.2. Accredited entity/executing entity capability to execute (medium risk)

52. The AE, Landbank of the Philippines (owned by the Government of the Philippines), will leverage its experience gained in implementing various official development assistance projects (loans or grants) from multilateral and bilateral funding institutions. However, the AE has no track record of working with DOST-PAGASA, the national hydrometeorological agency of the Philippines, which will be the EE; the Project Management Office will be established within the EE. While DOST-PAGASA acts as the EE, the outputs, activities and sub-activities will be implemented by various implementation partners. Various departments and offices of the Government of the Philippines, such as DILG, the Department of Environment and Natural Resources – Mines and Geosciences Bureau, and OCD, are concerned with project site LGUs; and WFP will be the implementation partner. The project involves components for capacity-building of the EE and implementation partners.

3.3.3. Project-specific risks (medium risk)

53. The project covers four cities/municipalities. Strong coordination among the AE, EE and the various implementation partners is necessary for successful implementation of the project. One of the components of the project is to conduct a gap assessment of the EE and implementation partner capacities in MH-IBF-EWS, such as:

- (a) Operation and maintenance beyond project completion: the funding proposal states that responsibility for operation and maintenance will lie with DOST-PAGASA (the EE) and the costs of the meteorological and hydrological equipment will be fully integrated into the budget of the EE. The political support to allocate necessary budget resources to the EE by the Government to sustain its operations and maintenance will be required for the sustainability of the project beyond its completion;
- (b) Performance risk: the AE identified potential risks that the impact-based weather forecasting system may not be as effective as expected. These risks could be derived from lack of support from all stakeholders, insufficient capacity and delays in improvement/adjustment of the system. The funding proposal mentioned that policies on continuity, capacity-building and continuous system calibration/upgrades will be included in the project; and
- (c) Economic and financial viability: the AE mentioned that the project investment of USD 20 million will be translated into the reduction of annual loss by USD 7.15 million caused by hazards of severe wind, storm surges and floods. The figures are estimated data at the national level instead of at project target province level. The AE has concluded that investment in EWS and impact-based forecasting will bring significant socioeconomic and environmental benefits based on the examples from other countries.

3.3.4. Compliance risk (low risk)

54. The project's core activities present limited risk for money laundering and terrorist financing. The AE has conducted a risk assessment of the exposure to money laundering and terrorist financing and reported that it has not identified any risk factors of note. Nevertheless, in the unlikely event that risks do arise, the AE assures that it has in place adequate anti-money-laundering and countering the financing of terrorism systems and controls to address related issues as they occur. However, given the extent of procurement required to execute various project

activities, the risk of prohibited practices is slightly elevated. In this regard, the risk mitigation strategy of the AE is to ensure that at the project level, the key stakeholders (namely, the AE, EE and LGUs – all being public institutions) are effectively guided by the full range of extant anti-bribery, graft and corruption national laws and regulations. In addition, to further reduce the risk of prohibited practices, the AE confirms that partners, contractors and suppliers in the private sector will be required to open an account with Landbank, through which payments will be made. Moreover, as clients of Landbank, these private sector actors will also undergo anti-money-laundering and countering the financing of terrorism screenings. In light of the minimal risk posed by the project, as well as the combined effect of the risk mitigation strategy of the AE, the overall compliance risk is deemed as low.

3.3.5. GCF portfolio concentration risk (low risk)

55. In the case of approval, the impact of this proposal on the GCF portfolio concentration in terms of results area and single proposal is not material.

Summary risk assessment		Risk assessment
Overall project/programme	Medium	Success of the project depends on strong coordination among the AE, EE and various implementation partners. Sustainability of the project relies on political support to allocate budget resources to the EE for the operation and maintenance activities.
Accredited entity (AE)/executing entity (EE) capability to implement the project/programme	Medium	
Project-specific execution	Medium	
GCF portfolio concentration	Low	
Compliance	Low	

3.4 Fiduciary

4. Does the project comply with the GCF AE fee policy?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
5. In case the EE (ies) is different to the AE, has the financial management capacity assessment of the EE (ies) undertaken?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

56. Landbank, the AE, will be responsible for overseeing, supervising, managing and monitoring the overall GCF-approved projects and programmes to achieve specified results with guidance from a project operations manual, which Landbank and DOST-PAGASA will prepare. A GCF programme team will be established by Landbank, which will conduct supervisory missions twice a year during the implementation period to ensure that the project is being implemented in accordance with the legal agreements that Landbank has entered into with GCF. In addition, Landbank will provide constant advice and guidance to the entities that will implement the project in terms of technical aspects, fiduciary requirements, environmental and social aspects, and monitoring and evaluation.

57. DOST-PAGASA will be the EE and will serve as the project's lead "implementing agency", Partner agencies that will implement specific project activities (such as DILG, MGB, OCD, concerned project site LGUs and the WFP) will be called "implementation partners". The implementation partners will be allowed to procure and disburse funds under the supervision of the EE.

58. A programme management office will be established within DOST-PAGASA and a project management team will also be established in each of the four project sites. A project site project



management team composed of DOST-PAGASA- PAGASA Regional Services Division, LGU Disaster Risk Reduction and Management Office, and project staff, in coordination with the local offices of DILG, MBG and OCD, will be established to manage implementation at the project site.

59. Fund disbursement will be from GCF to Landbank. The project funds will be deposited in a designated account managed by Landbank. As the main grant recipient, DOST-PAGASA would ensure that the terms and conditions outlined in the Subsidiary Agreements are passed on to the implementation partners as grant recipients and that payment for eligible expenditures will be released by Landbank to the EE and/or implementation partners in order to enhance accountability and oversight.

60. Landbank will request the Government's Commission on Audit to conduct the external audit of the project.

61. We recommend the following conditions to FAA execution;

- (a) The AE carries out a financial management capacity assessment for all the EEs of the project in compliance with the accreditation master agreement (AMA), and confirms they are satisfied with the capacities of the entities to execute the project; and
- (b) Delivery of a detailed project budget with budget notes on the assumptions and estimates applied, including unit costs and quantities, to the satisfaction of GCF.

3.5 Results monitoring and reporting

6. Is the project in line with the GCF monitoring and accountability framework?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
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62. The project aims to contribute to enhancing the climate resilience of vulnerable people and communities, including women and girls, exposed to hydrometeorological hazards in the Philippines through improved climate risk management. The project will scale up current initiatives of DOST-PAGASA on hazard and risk assessment, modelling and mapping using a probabilistic approach.

63. It is an adaptation project expected to impact an anticipated 467,919 people (0.5 per cent) as direct beneficiaries located at the project site and 8,040,935 (8 per cent) indirect beneficiaries located in the Cagayan valley river basin. The project aims to catalyse a paradigm shift from the traditional weather forecasts to MH-IBF-EWS. The project innovation includes combining best available science and local knowledge on probabilistic hazard mapping, modelling and forecasting, and risk assessment. The project will contribute to achieving the GCF impact level (A1): increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions.

64. The theory of change diagram shows a clear causal linkage between the barriers and proposed intervention with clear reference to assumptions and risks.

65. Regarding the timetable of implementation, most of the Secretariat's comments have been addressed. However, some minor revisions will be required for the changes made in the activities section of the funding proposal to be reflected in and aligned with the timetable and the logic framework in annex 2. Also, the timetable needs to reflect the standard reporting timelines to GCF regarding the inception report, financial reporting, annual performance review submissions and evaluations in conformity with the standard GCF timetable format.

66. For the logical framework, the revised funding proposal has incorporated some of the comments and suggestions provided by the Secretariat. However, it still requires revisions, especially in terms of missing baselines and targets, and ensuring that proposed targets align to the indicators. Some of the indicators do not have baselines, and, as most of the targets are contingent on the baselines, the AE may not be able to report on key results areas.

67. Under the Monitoring and Evaluation section of the funding proposal, the information provided is missing relevant information regarding the methodologies, for example, whether formative, process, summative, etc., to be employed for the midterm and final evaluations. Additionally, the funding proposal needs to outline a clear evaluation strategy for determining the causal impact of project activities prior to implementation. To understand the magnitude of the impact directly attributable to the project, it is suggested that the AE have a plan in place to estimate what would have happened to beneficiaries in the absence of the project. To accurately measure this counterfactual scenario, careful considerations must be made regarding programme rollout and data collection so that the outcomes of comparison groups can be observed. These groups should be statistically very similar to those that receive the project inputs, other than the fact that they are not beneficiaries themselves. Without planning a rigorous evaluation strategy prior to implementation, the project will miss out on a valuable learning opportunity that is relevant to other countries with populations that face similar vulnerabilities and barriers to adaptation.

68. The Secretariat recommends the following conditions be included in the funded activity agreement (FAA):

- (a) prior to FAA execution the submission to the Fund by the Accredited Entity, in a form and substance satisfactory to the GCF Secretariat, of a revised and improved logic framework for the project, including revisions to indicators, baselines, targets and means of verification; and;
- (b) a condition precedent twelve (12) months to FAA effectiveness that requires the AE to undertake and submit to GCF in a form and substance satisfactory to the GCF Secretariat, a detailed baseline study, that will allow for monitoring and assessment of the proposed expected impacts of the project during its implementation period.

3.6 Legal assessment

7. Has the AE signed the AMA?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <u>Date of AMA execution:</u> 27 September 2019
8. Has a bilateral agreement on privileges and immunities been signed with the country where the proposed project/programme will be implemented?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
9. Has a certificate of internal approval been submitted?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

69. The Accreditation Master Agreement was signed with the Accredited Entity on 27 September 2019 (the “AMA”), and it is not yet effective.

70. The Accredited Entity has provided a legal opinion confirming that it has obtained all internal approvals and it has the capacity and authority to implement the project.

71. The proposed project will be implemented in the Republic of the Philippines, country in which the GCF is not provided with privileges and immunities. This means that, amongst other things, the GCF is not protected against litigation or expropriation in this country, which risks need to be further assessed. Negotiations have been ongoing between the Secretariat and the country and a revised draft bilateral agreement on privileges and immunities was shared in 10 June 2019.

72. The Heads of the Independent Redress Mechanism (IRM) and Independent Integrity Unit (IIU) have both expressed that it would not be legally feasible to undertake their redress activities

and/or investigations, as appropriate, in countries where the GCF is not provided with relevant privileges and immunities. Therefore, it is recommended that disbursements by the GCF are made only after the GCF has obtained satisfactory protection against litigation and expropriation in the country, or has been provided with appropriate privileges and immunities.

73. In order to mitigate risk, it is recommended that any approval by the Board is made subject to the following conditions:

- (a) Signature of the funded activity agreement in a form and substance satisfactory to the Secretariat within 180 days from the date of Board approval, or the date of effectiveness of the AMA entered into with the Accredited Entity, whichever is later; and
- (b) Completion of legal due diligence to the satisfaction of the Secretariat.

Independent Technical Advisory Panel's assessment of SAP010

Proposal name: Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines

Accredited entity: Land Bank of the Philippines (LANDBANK)

Project/programme size: Small

I. Assessment of the independent Technical Advisory Panel

1.1 Impact potential

Scale: Not reported¹

1. The Philippines is an island State located along the typhoon belt in the western North Pacific Basin, which is where about 33 per cent of the tropical cyclones (TC) originate. It is also located at both the inter-tropical convergence zone and monsoon affected areas, marked with high rainfall distribution both spatially and temporally. The weather systems are prone to producing heavy rainfall, which in turn trigger floods and excessive rainfall-induced landslides. On the other hand, the temporal distribution of rainfall also gives rise to occasional drought. In recent times, the country has been faced with a few TCs with very high loss and damage. TCs and associated epiphenomena (e.g. floods, storm surges and landslides) have repeatedly caused loss of life and damage to property and the national economy.

2. Observational data suggest that the sea surface temperature around the country's maritime influence zones has been increasing over the past 30 years, which in turn has caused an increase in the genesis of intense TCs. The area is also influenced by El Niño-Southern Oscillation, which also contributes to the annual TC activity. An analysis of historical records on temperature over the past 65 years suggests that there is a consistent increase in mean temperature across the country. The increase in annual minimum temperature is in the order of 0.15°C/decade. A further investigation suggests that there have been an increased number of hot days and fewer cooler nights during the observational period, which is indicative of daily temperature extremes.

3. The total seasonal rainfall exhibits a markedly increasing trend over the northeastern section of Mindanao and eastern portions of Visayas for the period coinciding with the northeast monsoon season (i.e. the wet season). Extreme rainfall intensity is also found to be increasing, and the frequency of such events is also increasing. The findings are significant at 95 per cent level. None of the stations under analysis has shown a decreasing trend in extreme rainfall. The median intensity of extreme rainfall for the maximum 1-day rainfall (RX1day) is increasing, particularly in the northwest region.

4. Simultaneously, statistically significant increasing trends in maximum 5-days rainfall (RX5day) and associated other indices clearly exhibit a wetter monsoon season, especially in the northwest and central Philippines. Under climate change, a Representative Concentration Pathway 4.5 (i.e., RCP 4.5) scenario model analysis also indicates a further rise in extreme temperature and rainfall episodes. These phenomena, along with increasing TC activities,

¹ Scaling of small-scale projects is not a requirement. Similarly, it is not mandatory to scale investment criteria for projects under the simplified approval process.

clearly suggest that under climate change, the country will be highly prone to a number of meteorological hazards in future decades.

5. The available scientific literature infers that the magnitude and relative frequency of TCs may be affected by climate change. Unfortunately, a significantly large proportion of the population lives in low-lying coastal areas that are also typhoon prone. As a consequence, the increase in high-intensity TCs means that the population of the island State has become highly vulnerable. The increasing trends in the changing climate have already wreaked havoc on the lives and livelihoods of poor islanders across the nation. This warrants effective measures to ensure a better understanding of imminent typhoons and related epiphenomena, with locally understandable messaging and along with locally relevant response measures so that the population may take appropriate response measures to safeguard their lives and livelihoods.

6. The Philippines' National Meteorological and Hydrological Service of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (DOST-PAGASA) is operating under the Department of Science and Technology. It is the mandated agency for providing adequate, up-to-date data and timely information on atmospheric, astronomical and other weather-related phenomena. DOST-PAGASA has been providing the following services routinely: weather forecasts, tropical cyclone warnings, information on the probable daily weather conditions, general advisories and hydrological forecasts about the Pampanga, Agno, Bicol and Cagayan (PABC) river basins; and vital agro-meteorological and seasonal climate information for farming activities, proper farm management and necessary planning for farmers. The last few decades have been marked by widespread disasters in the Philippines that are mostly caused by hydro-meteorological hazards.

7. Over the years it is understood that DOST-PAGASA needs support to upgrade its services to cater to the greater need to issue accurate impact-based forecasts and establish an early warning system (EWS) so that loss and damage from meteorological hazards may be reduced significantly. The need to upgrade DOST-PAGASA became paramount in 2004 after the occurrence of a series of tropical cyclones resulted in massive floods and landslides. This triggered a paradigm shift in disaster management from relief and response to preparedness and mitigation in the Philippines. In 2010, the Philippine Disaster Risk Reduction and Management Act (Republic Act 10121) became a law. The proposed project is designed to address the much-heightened needs mentioned above.

8. The objectives of this project are to reduce the exposure of vulnerable communities to climate-induced hydrometeorological hazards, strengthen their adaptive capacities to better manage or adjust to impacts brought about by climate shocks and climate change, and implement long-term climate risk reduction and adaptation measures. In an attempt to achieve these objectives, the project intends to implement the following four outputs with corresponding activities:

- (a) Generating science-based multi-hazard and climate risk information;
- (b) Establishing a multi-hazard impact-based forecasting and early warning system (MH-IBF-EWS), which is supported by a knowledge and decision support system;
- (c) Improving national and local capacities in implementing a people-centric MH-IBF-EWS and forecast-based early actions; and
- (d) Mainstreaming climate risk information and MH-IBF-EWS in development policy/planning, investment programming and resilience planning at national and local levels and institutionalizing a people-centred MH-IBF-EWS in the Philippines.

9. The project will be implemented over five years with a total budget of USD 20.191 million. A total of USD 9.999 million is sought from GCF as a grant. Land Bank of the Philippines (LANDBANK), a direct access entity, will be the accredited entity for the project, while DOST-PAGASA will be the primary executing entity.



10. The project will be implemented in four areas within the Philippine archipelago: (a) Tuguegarao City, Cagayan, in the northeast, which is vulnerable to floods and severe wind; (b) Legazpi city, Albay, in the central eastern region, which is affected by floods and severe wind; (c) Palo, Leyte, in the central eastern region, which is affected by storm surges and severe wind; and (d) New Bataan, Davao de Oro, in the south-eastern region, which is affected by landslides and severe wind. The total number of direct beneficiaries is 467,919 people, of which 232,725 are women. The total number of direct beneficiaries represents 0.5 per cent of the population. The indirect beneficiaries include a total of 8.041 million people, which corresponds to 8 per cent of the 104.9 million people of the island State.

11. The project is innovative and it will require an extensive consultative process to involve local affected stakeholders for the ground-truthing of modelled data, which is why a nation-wide coverage could not be envisaged under the small-scale pilot phase. Therefore, the impact potential appears medium, taking into consideration the number of direct and indirect beneficiaries with respect to the total population. However, given the strengthening of DOST-PAGASA to embark upon a paradigm of impact-based EWS beyond the project timeline, the apparently low potential impact should not be assessed on the basis of low beneficiary coverage. The modest level of coverage does not justify the real potential impact of the project. The level of impact is usual for a project undergoing the simplified approval process.

1.2 Paradigm shift potential

Scale: Not reported

12. The project focuses on people-centric, impact-based forecasting and EWS, which in itself is indicative of a decisive shift in the existing paradigm. Not only will the project increase the coverage of early warning from a few identified hazards to multiple (meteorological) hazards, it will aim to deliver impact-based locally-relevant forecasts that can be easily understood by end users in practical terms. It would avoid using scientifically-driven abstract terminologies, which are not very useful for many of the hazard-prone, vulnerable communities. In real terms, this is a fundamental leap from business-as-usual early warning dissemination to hazard and impact-based forecasts that have local-level relevance and people can implement response measures those are suited to local contexts.

13. The proposed approach not only simplifies the warning messages, but it makes them locally relevant, clearer in terms of gravity of the situation and instructive as to where to find reference responses. Moreover, the same messaging process will (i) assist the communities that provide support services, national and local authorities and humanitarian agencies, etc., to take early action during the window of anticipation;² and (ii) provide an indication of the lead time to the actual hazardous event. The proposed approach aims to adopt the best available science and technology developed by the World Meteorological Organization (WMO), which will remove scientific uncertainties as much as possible and greatly facilitate the quality of computational forecasts. In this view, the project is likely to catalyse impacts far beyond a one-off project investment.

14. Since the ground-truthing to find local relevance for forecasting will be tested only in a few defined areas in the country, the same technique will also be used by DOST-PAGASA in future steps to replicate the efforts to issue locally relevant and meaningful early warnings in other areas. Therefore, the replication potential within the Philippines is tremendous. The entire project is innovative, especially in its approach and modalities to tackle existing pitfalls in business-as-usual forecasting approaches. The WMO methodology will be adopted, which will be aided further by the acquisition and utilization of a supercomputer such as Cray which has great computational capacity. Following the project timeline, the relevant institution (i.e., DOST-PAGASA) will scale up its operation gradually, and the warning system will eventually cover the

² Each message referring to certain probability of occurrence within a defined timeline into the immediate future.



entire country. Therefore, the expected contribution to overall development in terms of disaster risk reduction is significant.

15. The funding proposal includes a theory of change, which presents a clear indication of how the project will trigger upscaling and gradual replication within the country. The potential for exporting key structural elements elsewhere in the country is also quite clear.

16. The project will establish local relevance of a forecast by going through an exercise of ground-truthing, which will involve local benchmarking and experience sharing with local stakeholders, including the representatives of the most vulnerable population in the target areas. This exercise alone will help create a locally relevant knowledge base of known hydro-meteorological hazards and facilitate learning about the types and extent of impacts under a given hazard. Moreover, the personnel of DOST-PAGASA will have opportunities to learn from its internationally renowned partner institutions through formal capacity-building measures and hands on computational trainings on data acquisition and model handling, including post-processing and graphical representation of forecasts. All of this will not only advance national as well as local capacities in terms of knowledge and learning, it will also ensure the sustainability of the efforts in future operations of DOST-PAGASA.

17. The activities related to institutional capacity-building are indicative of the creation of an enabling environment. The acquisition and installation of meteorological data loggers, the use of the Cray supercomputer for modelling and data processing, the joint ground-truthing exercise involving DOST-PAGASA staff, local government units and local people, and the reference impact-response tables will not only improve the understanding of forecasts being issued, but it will also reduce gaps in understanding between the forecasters (i.e., meteorlogical scientists) and the end users (the affected population). Moreover, the choice of dissemination methods to reach the end users, especially via channels such as social media, will likely to enhance access to such forecasts and warnings in remote islands across the Philippines. The flow charts provided as the schematic plans for reaching out to the beneficiary groups are testimonies to the efforts considered for the dissemination of warnings through the project and beyond its lifetime.

18. As such, the project will not develop any new market, or business activities at any level. It will not aim to develop a new policy regime. However, the project will aim at enhancing existing (response) manuals and guidelines towards mainstreaming climate risk information and developing site-specific early action protocols. These instruments will enable not only the country to issue warnings, but also the stakeholders, including the most vulnerable populations, to respond to such warnings. These efforts will be further consolidated by strengthening national inter agency operational coordination mechanisms to introduce the MH-IBF-EWS.

19. In view of the above discussions, the independent Technical Advisory Panel(iTAP) finds that the project's overall contribution to paradigm shift is high.

1.3 Sustainable development potential

Scale: Not reported

20. The project will provide people-centric early warnings for the end users, which will in turn reduce the burden of loss and damage to properties and infrastructure. In climate-vulnerable societies, these outcomes are extremely useful. However, these outcomes are not captured well in the global framework of the Sustainable Development Goals (SDGs), with an exception of SDG 13, which calls for taking urgent action to combat climate change and its impacts. The project is likely to contribute greatly to the achievement of SDG 13 for the Philippines.

21. The issuance of early warnings will enable the vulnerable population to take early measures for the avoidance of loss of assets and sources of livelihoods, which in turn will help reduce loss of income and alleviate poverty in the project sites. This is the aim of SDG 1. Such

outcomes contribute to household well-being and bring about the sustenance of local economies that are at risk of exposure to certain meteorological hazards. Local economic activities, including production and exchanges, are expected to avoid disruption due to risk-informed local development planning and investment programming. The risk-response tables will help organize and protect natural resources that generally serve as buffers to the adverse impacts of such hazards. These outcomes will contribute to the achievement of SDG 11, which calls for making cities and human settlements inclusive, safe, resilient and sustainable.

22. The outcomes of the project will be useful in target areas to bring vulnerable populations to safety in an event of a meteorological emergency. People will be able to consider effective measures to safeguard their lives and livelihoods. Collective actions at the community level are also likely to help consolidate cohesion among participating groups. These social co-benefits are likely outcomes of the project.

23. The issuance of an early warning should be meant for all the segments of a society. However, an increase in lead time becomes increasingly gender-sensitive due to the fact that women can effectively utilize the additional time not only to serve the household they represent, they can play active roles in preparedness, especially towards safeguarding lives and livelihoods. One of the activities of the project (activity 3.2) is aimed at building gender-sensitive institutional and technical capacities to implement EWS, which will enable the institutional processes to become increasingly gender-sensitive. This will help address the needs of women and reduce gender inequalities in responding to hazardous phenomena.

24. In view of the above, the iTAP finds the sustainable development potential of the project to be medium to high.

1.4 Needs of the recipient

Scale: Not reported

25. The Philippines is particularly vulnerable to climate change due to its geographical position. In a given year, about 20 typhoons form in the region, devastating the low-lying coastal areas. Since the major cities are located at such low elevations in coastal areas, storm surges often inundate these cities and cause loss of lives and damages to assets and infrastructure. Available statistics suggest that 60 per cent of the total land area of the country and 74 per cent of the population are exposed to multiple hazards. Between 2000–2016, extreme weather events had a death toll of more than 20,000 and the damages amounted to about USD 20 billion. The country ranks among the top five in a long-term climate risk index involving 20 year period.

26. The gender dimensions of hazards such as typhoons, storm surges and floods are well articulated in the growing body of literature, especially in low lying urban areas. Even when warnings are issued, women are found to be more vulnerable than men due to the fact that they cannot immediately leave their respective homes without taking a few precautionary measures at home. In this process, they lose valuable time and thereby cannot take full advantage of the warning. Female-headed households are found to bear the highest human and economic tolls in case of such hazards. Therefore, an attempt to increase lead time for response to and issue an warning in the local context of vulnerability and impacts is important to create greater access to the warnings for vulnerable women.

27. The Philippines is a lower middle-income island State, which is ranked 113th in the Human Development Index. In recent times, the country has made good strides in economic growth. However, poverty still is pervasive amongst a substantial part of the total population (i.e. 22 million out of 104.9 million). According to available statistics, poverty has declined from 26.6 per cent to 21.6 per cent between 2006 and 2015. In the event of typhoons and associated hazards, it is the poorer sections of society that suffer the most. The project clearly highlights the economic profile of the four target areas, and the hazard profiles are also taken into



consideration. The historical accounts of hydrometeorological hazards, damage figures, and the overall vulnerability justify why these sites are chosen for the implementation of the project.

28. By enacting a law (the Republic Act 10121 on disaster risk reduction and management), the Government of the Philippines has announced its intent to address the issue of multi-hazard early warning. However, when dealing with multiple typhoons and other hazards while investing in social and economic sectors, it is difficult to arrange large-scale investments in the modernization of the current warning system and make the warnings more user-friendly. Local government units also have limitations in terms of resource mobilization in disaster risk reduction. Unfortunately, as the project outcomes are public goods and services, it is difficult to attract private sector financing. These factors leave no other option than to request GCF to mobilize its resources. Given the high vulnerability of the country, a grant financing is requested and is fully justified.

29. DOST-PAGASA has been providing early warning in a business-as-usual fashion up to now. However, until the institutional weaknesses are duly addressed and the quality of the warning and dissemination modalities are upgraded, the poor users in remote islands may not benefit in the wake of climate change-induced and -strengthened typhoons and TCs. The need for an institutional capacity-building and the project's approach to deliver more user-friendly early warning that covers multiple hazards is well justified.

30. In view of the above discussions, the iTAP assesses the needs of the recipient as high.

1.5 Country ownership

Scale: Not reported

31. The 2019 General Appropriations Act of the Philippines makes provisions in the budget for the establishment of multi-hazard, impact-based forecasting and EWS and the creation of local disaster risk reduction and management offices in all local government units. This indicates how seriously the matters related to MH-IBF-EWS have been considered in the country. The National Climate Change Action Plan (2011–2028) and the National Framework Strategy on Climate change (2010–2022) have set priorities regarding forecasting, early warning and disaster risk communication and also on knowledge and capacity development. The nationally determined contribution document highlights the mainstreaming of climate change adaptation and disaster risk reduction. These clearly indicate that the project is in alignment with the policy regime prevailing in the country.

32. The DOST-PAGASA is the national institution with the legal mandate to advance any given issue with respect to MH-IBF-EWS. The project aligns with the three components of DOST-PAGASA's roadmap towards a world-class meteorological/hydrological agency for 2019–2022. As the demand for more accurate, timely and effective weather information increases, DOST-PAGASA is enhancing its weather monitoring and observing facilities through the densification of different weather observation networks to broaden its base for the delivery of service to the countryside. The progression in scientific know-how will ultimately ensure better adaptation strategies. These initiatives are embedded in its Strategic Plan for 2018–2022, which outlines the collective efforts to sustain and help create a disaster- and climate-resilient nation. This project will not duplicate any of these initiatives because the emergence of MH-IBF-EWS was not yet apparent at that time and therefore no resources were allocated for transforming the way it operated from a hazard-based forecasting system to an impact-based forecasting and warning system.

33. The project's early warning delivery activities are focused on creating access for the end users. Close consultations involving national and local stakeholders contributed heavily to this process. The local context-specific analyses have contributed to the development of the project. Four stakeholder consultation workshops were conducted by DOST-PAGASA, LANDBANK and the Climate Change Commission to delineate the scope of the project, identify the different

stakeholder groups and their respective roles and contributions to the project, solicit inputs for the development of the funding proposal, and assess the gaps and challenges in the existing forecasting and EWS in the country. The process kept the national designated authority (i.e. the Climate Change Commission) informed and the project received its endorsement in due course.

34. LANDBANK is a national financing institution for development projects in the Philippines. It is accredited to GCF as a direct access entity. It has served the country's development process by financing large projects. It works together with DOST-PAGASA to improve the nation's EWS and, in this process, chose the WMO-led model, which is an example of a global best practice. The process involves WMO expertise at the outset. The multi-stakeholder project board is well represented to steer the processes under the project.

35. Following an analysis of the country ownership, the iTAP believes that the country shows a high level of ownership for the project.

1.6 Efficiency and effectiveness

Scale: Not reported

36. Literature suggests that investment in EWS and IBF can save lives, help protect property and bring about significant socioeconomic and environmental benefits. EWS provide direct, tangible benefits in the form of avoided damages to households and various sectors due to appropriate responses utilizing lead time; indirect benefits include avoidance of production losses, relief and rehabilitation costs, and costs involved in providing such services.

37. The project is supported by a co-financing amount that matches the GCF contribution. The co-financing for this simplified approval approach project is unusually high. The budgetary allocation for each of the four broad outcomes of the project appears justified. This provides a strong financial basis for rolling out the project activities.

38. A cost-benefit analysis model has not been produced for the MH-IBF-EWS project due to the difficulty of estimating the exact magnitude of benefits resulting directly from the project. The pre-feasibility Study has instead shared some evidence to show that targeted communities suffer high losses due to typhoons and other climate-related disasters. Along with some studies from other countries³ showing the effectiveness of their own EWS, these provide examples of the effectiveness of EWS in increasing the avoided costs brought about by climate-related disasters. The proposal cites examples from Bangladesh and Fiji, where investments made in EWS have been quite cost effective. The EWS in Bangladesh and Fiji further prove that these systems can be cost effective in the reduction of some of these climate-related losses and damages.

39. The project aims at engaging technologies and methodologies that are among the best in the business. The WMO model will be implemented, which is among the global best practices. The modelling aspects in the development of warnings are envisaged to be initially handled by partners who are globally renowned and reliable. The technology exit plans are well thought out, which will support DOST-PAGASA through staff training and equipment. Such investments are generally risk free. The data loggers used to obtain an increased breadth of weather information will be placed in secured areas under direct supervision of the local government units, while the equipment will be brought under the usual operation and maintenance practices of DOST-PAGASA.

40. Despite these safety cushions, the absence of a cost-benefit analysis leaves a gap in understanding the potential financial and economic benefits likely to be accrued by the project. Under such conditions, the iTAP believes that the overall effectiveness and efficiency of the project is barely medium.

³ Examples of Bangladesh and Fiji are duly analyzed and cited.

II. Overall remarks from the independent Technical Advisory Panel

41. Despite the relatively low rating in terms of efficiency and effectiveness caused by the absence of a thorough economic cost-benefit analysis, the iTAP recommends that the Board approve the project.



Response from the accredited entity to the independent Technical Advisory Panel's assessment (SAP010)

Proposal name: Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines

Accredited entity: Land Bank of the Philippines (LANDBANK)

Impact potential
The assessment is succinct, very well-written and captured the whole essence of the need for this project and what it will entail in terms of implementation on the ground. Indeed, the impact potential may appear moderate based on the low beneficiary coverage but it is rightly said that the modest coverage does not justify the real potential impact of the project. Thank you for the fair assessment.
Paradigm shift potential
Thank you for rating the paradigm shift potential of the project as High. All the essential points of the project's intentions to produce real change on the ground for climate adaptation and risk management through co-production of knowledge with local communities and maximizing the use of science and innovations into policy and practice have been captured.
Sustainable development potential
We appreciate the detailed assessment of the sustainable development potential of the project and agree that the project will significantly contribute to the achievement of SDGs 11 and 13. We also gladly note the remarks on the potential contribution of the project on gender considerations. Thank you for your assessment of Medium to High.
Needs of the recipient
The assessment is on the mark with regards to the increasing exposure and vulnerability of the country to climate-induced hydro-meteorological hazards, the uneven impacts of climate change and disasters on the population based on gender and the economic toll that climate change and disasters exact from the country. We also agree that the need for an institutional capacity building and its approach to deliver a more user-friendly early warning that covers multiple hazards is High.
Country ownership
Thank you. We agree with your assessment of country ownership as HIGH.
Efficiency and effectiveness
Thank you for pointing out that the project is matching the co-financing amount to the GCF financing. We are glad to note that this co-financing for a SAP project is unusually high. We also appreciate the positive assessment of utilizing technologies and methodologies which are among the best in the business, including the WMO model which is a global best practice and the technology exit strategy. The concern on efficiency and effectiveness shall be properly considered during the conduct of the monitoring and evaluation activities.



Overall remarks from the independent Technical Advisory Panel:

We are very pleased with the outcome of the assessment. Likewise, we are grateful to the ITAP for their fair and favorable assessment. Thank you for recommending the project for GCF Board approval.



Annex 4

GENDER ASSESSMENT AND ACTION PLAN

**Multi-Hazard Impact-Based Forecasting
and Early Warning System for the
Philippines**

The Situation of Gender Equality in the Philippines

1. The Republic of the Philippines is a sovereign state and archipelagic country situated in Southeast Asia in the Western Pacific Ocean, with 7,641 islands spanning more than 300,000 square kilometers (115,831 sq. mi) of territory. It is divided into three island groups: Luzon, Visayas, and Mindanao.¹ The Philippines is a unitary presidential constitutional republic, with the President of the Philippines acting as both the head of state and the head of government. It is a founding member of both the United Nations (UN) and the Association of Southeast Asian Nations (ASEAN)².
2. Based on the 2015 Census of Population by the Philippine Statistics Authority (PSA), the population of the Philippines has a total of 100,981,437 individuals. Luzon, which is composed of eight regions, comprised more than half (56.9%) of the country's total population, followed by Mindanao (23.9%), which has six regions and Visayas (19.2%), which has four regions. Of the total population, 50.6% were males while 49.4% were females which resulted in a sex ratio of 102 males for every 100 females. In the age groups 0-45, males outnumbered females. Females, on the other hand, outnumbered their male counterparts in the older age groups of 55 years old and over. Among the never-married persons, a higher proportion of males (54.1%) than females (45.9%) was reported. Meanwhile, the proportion of females was higher than males among those who were widowed (77.0%), divorced/separated (61.4%), in common law/live-in marital arrangement (50.5%), and married (50.2%). Among those with baccalaureate degree, there were more females (56.0%) than males (44.0%). Similarly, among those with post baccalaureate courses, females (59.9%) outnumbered males (40.1%). Meanwhile, the school attendance rate was higher among females (69.4%) than among males (68.6%).³
3. According to UNDP's Human Development Reports, the Human Development Index (HDI)⁴ of the Philippines for 2017 values 0.699 which placed the country in the medium human development category. With this, the Philippines together with South Africa ranks 113 out of 189 countries and territories calculated. In terms of Gender Development Index (GDI)⁵, the Philippines was placed in Group 1 – with high equality in HDI achievements between women and men. This is based on 2017 female HDI value for Philippines which is 0.699 in contrast with 0.698 for males, resulting in a GDI value of 1.000. On the other hand, the Philippines ranked 97 out of 160 countries based on Gender Inequality Index (GII)⁶ value of 0.427. This is based on the following statistics of the Philippines: 29.1% of parliamentary seats are held by women; 76.6% of adult women have reached at least a secondary level of education compared to 72.4% of their male counterparts; for every 100,000 live births, 114 women die from pregnancy related causes; adolescent birth rate

¹ United Nations Development Programme (UNDP). *About the Philippines*. Retrieved from <http://www.ph.undp.org/content/phippines/en/home/countryinfo.html>

² About the Philippines. (n.d.). Retrieved from <https://www.gov.ph/web/guest/about-the-philippines>

³ Philippine Statistics Authority (PSA). *2015 Census of population*.

⁴ HDI is a summary measure for assessing long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living.

⁵ GDI is defined as a ratio of the female to the male HDI based on the sex-disaggregated HDI.

⁶ GII reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity.

is 60.5 births per 1,000 women of ages 15-19; and female participation in the labour market is 49.6% compared to 75.1 for men.⁷

4. In the Global Gender Gap Report 2018 of the World Economic Forum (WEF), the Philippines is top 8 in the list of the most gender-equal country out of the 149 countries assessed. The Philippines climbed two places from its 10th place ranking in 2017. The countries were assessed based on the following four categories: labor force participation, educational attainment, health and survival, and political empowerment. WEF mentioned that the Philippines maintained its high ranking on the back of strong efforts to close the gender gap in political empowerment. The country, however, needs improvement in categories such as health and survival. WEF measures health and survival indicator through looking into the differences between women's and men's health based on life expectancy. In terms of educational attainment, the gender gap in equality remains sealed. Meanwhile, WEF recorded an improvement in economic participation and opportunity as a result of increased wages for women's estimated income and equal pay for similar work. The Philippines ranks higher than any other Asia-Pacific country except New Zealand.⁸

International and Regional Commitments & National Legislation and Policies on Gender

5. According to the Philippine Commission on Women (PCW), efforts to make governance gender responsive in the country are promoted through the inclusion of gender equality principles in development programs and processes and legislative reforms.⁹ In fact, the Philippines is one of the few countries with provision on gender in its Constitution. It is mentioned in Article II, Section 14 that "the State recognizes the role of women in nation-building, and shall ensure the fundamental equality before the law of women and men" while in Article XIII, Section 14, the constitution maintains that "the State shall protect working women by providing safe and healthful working conditions, taking into account their maternal functions, and such facilities and opportunities that will enhance their welfare and enable them to realize their full potential in the service of the nation."¹⁰
6. The Philippines is also one of the earliest signatories to the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW). Before CEDAW came into effect on September 3, 1981, the Philippines has signed it on July 15, 1980 and ratified it on August 5, 1981, the first ASEAN country to do so. The Philippines also ratified the Optional Protocol to the CEDAW on November 12, 2003. Over the last two decades, six State reports were submitted by the country to the CEDAW in compliance with the obligations of State Parties. Consecutively, three NGO shadow reports accomplished by 47 NGOs were

⁷ UNDP. (2018). *Human development indices and indicators: 2018 statistical update*. New York, NY 10017 USA. Retrieved from http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/PHL.pdf

⁸ World Economic Forum (WEF). (2018). *The global gender gap report 2018*. Geneva, Switzerland. Retrieved from http://www3.weforum.org/docs/WEF_GGGR_2018.pdf

⁹ Philippine Commission on Women (PCW). *Philippine initiatives on gender-responsive governance*. Retrieved from <https://www.pcw.gov.ph/focus-areas/gender-responsive-governance/initiatives>

¹⁰ Republic of the Philippines. (1987). *The 1987 Constitution of the Republic of the Philippines*. Retrieved from <http://hrlibrary.umn.edu/research/Philippines/PHILIPPINE%20CONSTITUTION.pdf>

also submitted. The reports were results of greater government and NGO consultation which involved several discussions and major consultation with members of civil society.¹¹

7. In September 1995, through Executive Order 273 by then President Fidel V. Ramos, the Philippine Government adopted the Philippine Plan for Gender-Responsive Development (PPGD) 1995-2025. It contains the long-term vision of women's empowerment and gender equality and translates the Beijing Platform for Action (BPFA) into policies and strategies and programs and projects for Filipino women. This 30-year perspective plan ensures that women-friendly policies can take root and flourish despite the barriers posed by traditional attitudes and stereotyping.¹² The Plan has been implemented through a Gender and Development (GAD) mainstreaming strategy and in accordance with existing guidelines for the preparation of agency specific agenda and use of the gender budget.
8. Furthermore, since 1995, all government institutions are mandated to allocate at least five (5) percent of their regular budget to GAD.
9. As guided by PPGD and BPFA framework, the Framework Plan for Women (FPW) 2001-2004 was prepared by the National Commission on the Role of Filipino Women (NCRFP), (now Philippine Commission on Women or PCW) following the direct instructions from President Gloria Macapagal-Arroyo. It concretizes the priority goals of government towards the advancement of women. The FPW envisions development as "equitable, sustainable, free from violence, respectful of human rights, supportive of self-determination and the actualization of human potentials, and participatory and empowering." It has the following three priority areas: promotion of women's economic empowerment, protection and advancement of women's rights, and promotion of gender responsive governance. Progress has been achieved in terms of implementing the measures in FPW including the Department of Budget and Management (DBM) issuance of annual budget circulars since 1997 that support the implementation of GAD budgets at the local level. With this, several projects have been implemented under the GAD budget including: providing health services, advocating and disseminating information on gender issues, building capacity and providing technical assistance on GAD and other gender issues, establishing or improving service facilities for women, issuing policies on gender, establishing databases and mechanisms for reporting on gender issues, improving awareness of gender issues when undertaking development planning at the national and local levels, and revising textbooks to remove social and gender stereotypes.¹³
10. Meanwhile, in September 2000, the Philippines as a State Party to the United Nations adopted the Millennium Declaration that gave birth to the Millennium Development Goals (MDGs) which embodies specific targets and milestones in reducing poverty and the worst forms of human deprivation. The third MDG focuses on promoting gender equality and empowering women with the target of eliminating gender disparity in primary and

¹¹ PCW. *Philippine participation to CEDAW*. Retrieved from <https://www.pcw.gov.ph/international-commitments/cedaw/philippine-participation>

¹² UN Women. *Philippine Plan for Gender-Responsive Development*. Retrieved from <http://evaw-global-database.unwomen.org/fr/countries/asia/philippines/1995/philippine-plan-for-gender-responsive-development-1995-2025>

¹³ PCW. *Philippine initiatives on gender-responsive governance*. Retrieved from <https://www.pcw.gov.ph/focus-areas/gender-responsive-governance/initiatives>

secondary education preferably by 2005, and at all levels by 2015. The health indicators and economic indicators for this target include: ratios of girls to boys in primary, secondary and tertiary education; share of women in wage employment in the non-agricultural sector; and proportion of seats held by women in national parliament.¹⁴ The MDG Fifth Progress Report of the Philippines reported on gender that boys are at a disadvantage in terms of elementary and secondary education participation, cohort survival rate, and completion rate. The Report also shows that more females enroll in tertiary education and that there is a wide disparity in terms of functional literacy between males and females, with the females having the advantage.¹⁵

Gender and Climate Change in the Philippines

11. It is well known that women and men are experiencing the impacts of climate change and associated severe weather events differently. In the Philippines, it was found that female-headed households were more likely to be susceptible to flooding and other storm-related impacts. As occurred after Typhoon Ondoy (Ketsana), vulnerability assessments showed that female-headed households experienced greater damage cost. Greater temporary loss of income, on the other hand was experienced by male-headed households. Meanwhile, studies examining the aftermath of Typhoon Yolanda (Haiyan) suggest that roughly 50% more adult females died than males. In terms of the effects of climate change-induced food insecurity on women and girls, it was reported that infant mortality after typhoons increased among girls but not among boys. This is attributed to competition for scarce resource within families, as research claims. Existing literatures also reveal that, as of 2010 only 11% of land in the Philippines is managed by women. Inaccessibility of women to own or manage lands increases their vulnerability to climate shocks. In contrast, individuals who have access to land are more likely to adapt to the impacts of climate change.¹⁶
12. Climate change is one of the most serious and pervasive developmental and environmental challenges of today. An archipelagic nation of over 100 million people, the Philippines now faces threats from more intense tropical cyclones, drastic changes in rainfall patterns, sea level rise, and increasing temperatures contributing serious impacts on natural ecosystems cascading to food security, water resources, human health, public infrastructure, energy, and human settlements¹⁷. At the core of the country's efforts to achieve resilience and sustainable development from the impacts of climate change are effective environmental management, climate change adaptation and mitigation, as well as disaster risk reduction.

¹⁴ PCW. *What are the MDGs?* Retrieved from <https://www.pcw.gov.ph/international-commitments/mdgs/indicators>

¹⁵ National Economic and Development Authority (NEDA). (2014). *The Philippines Fifth Progress Report - Millennium Development Goals Executive Summary*. Retrieved from <http://www.neda.gov.ph/wp-content/uploads/2014/08/MDG-Progress-Report-5-Final.pdf>

¹⁶ Global Gender and Climate Alliance (GGCA). (2016). *Gender and climate change: a closer look at existing evidence*. Retrieved from <https://wedo.org/wp-content/uploads/2016/11/GGCA-RP-FINAL.pdf>

¹⁷ National Framework Strategy on Climate Change 2010-2022

13. Inequality is often worsened by various risks and hazards that can affect the situation of the poor, the vulnerable, and the severely marginalized. The costs of natural disasters amount not only to billions of dollars lost in economic resources but also in the distress and losses of the people affected. Over 9 million people were distressed by typhoons Ondoy (Ketsana) and Pepeng (Parma). While this number includes both the rich and the poor, the poor are far more vulnerable to such kinds of hazards; they also find it more difficult to go back to their original state of life. Women also remain to be extra vulnerable to climate change impacts, particularly on the impacts of extreme weather events. Typhoon Yolanda (Haiyan) affected approximately 16 million individuals, half of whom are women and girls¹⁸.
14. Women depend on agriculture, fishery, and forestry for their livelihood. These sectors are at risk from rising temperatures and weather variability¹⁹. The dependence of women on the environment due to the type of their livelihoods, compounded with their inability to access safety nets, significantly lowers their adaptive capacity²⁰. In addition, vulnerable forms of work affect both sexes, such as unpaid labor, but it seems that a larger number of women are employed in such exploitative employment practices (2.3 million unpaid women family workers vs. 1.8 million for men, 2012 data)²¹.
15. Typhoon Yolanda's (Haiyan) damages to agriculture and infrastructure and private properties reached almost \$899 million (Php 40 billion). The Asian Development Bank estimated that it would have increased the national poverty incidence by 1.9 percentage points. The National Economic and Development Authority (NEDA) has formulated the Reconstruction Assistance on Yolanda (RAY) to guide the recovery and reconstruction of the economy, lives, and livelihoods of people and communities in the areas affected by Yolanda. The plan aims to restore the economic and social conditions of the said areas at the very least to their pre-typhoon levels and to a higher level of disaster resilience. An estimated \$8 billion (Php 361 billion) is required for shelter and resettlement, public infrastructure, education and health services, agriculture, livelihoods and enterprises and services, local government and social protection²².
16. Women are more vulnerable to climate change impacts, particularly on the impacts of extreme weather events. Females may be on their monthly period, or pregnant, nursing or caring for infant/ children, at the time when a typhoon hits. The DSWD, as one of the agencies tasked to respond to disaster needs, employs a cluster approach that aims to optimize the efforts of the local and national stakeholders, the United Nations and other international organizations. Hygiene kits for women were part of the relief packs distributed in evacuation sites. Post-disaster gender-responsive initiatives include the creation of women and child-friendly spaces, deployment of policewomen in evacuation centers, and the establishment of a referral system to protect survivors from discrimination, abuses and gender-based violence. Women are provided assistance in terms of psycho-social support and provision of livelihood opportunities. Transitional

¹⁸ Women and the Environment, Beijing Platform for Action (BPfA+20) Philippine Progress Report

¹⁹ National Climate Change Action Plan of the Philippines

²⁰ Ibid.

²¹ Women and the Environment, Beijing Platform for Action (BPfA+20) Philippine Progress Report

²² Philippine 5th MDG Progress Report, 2014

houses are built in consideration of gender and needs of vulnerable sectors. To further strengthen their adaptive capacity, cash/food for work programs integrate the gender dimension to ensure women's equal access²³.

Enabling Policies and Institutional Mechanisms

17. A number of policies were passed to address the vulnerabilities of women from the impact of natural disasters. The Magna Carta of Women of 2009 mandates that "women have the right to protection and security in times of disasters, calamities, and other crisis situations especially in all phases of relief, recovery, rehabilitation, and construction efforts"²⁴. The Climate Change Act of 2009, as amended, provided the institutional arrangement to mainstream climate change in government policy formulations. It created the Climate Change Commission as the lead policy-making body of the government tasked to coordinate, monitor and evaluate the programs and action plans on climate change. The Act provides that at least one (1) of the three (3) Commissioners to be appointed by the President shall be female²⁵. It also provided for the creation of a National Strategic Framework on Climate Change and the National Climate Change Action Plan which looks at seven (7) strategic priorities, namely, food security, water sufficiency, ecological and environmental stability, human security, climate-friendly industries and services, sustainable energy and capacity development. Gender mainstreaming is one of the cross-cutting strategies. The People's Survival Fund mandated that responsiveness to gender-differentiated vulnerabilities be part of the criteria in selecting adaptation projects for funding. It also provides for the allocation of an initial \$22 million per year for the government to effectively address the problem of climate change²⁶.
18. The Philippine Disaster Risk Reduction and Management Act of 2010 states that the government "must ensure that disaster risk reduction and climate change measures are gender responsive." The law also institutionalizes gender analysis in early recovery and post disaster needs assessment and requires the Head of the Local Gender and Development Offices to be a member of the Local Disaster Risk Reduction and Management Councils to ensure that gender concerns and special needs of women are addressed.
19. In 2015, the Paris Agreement, which the Philippines ratified in 2017, was adopted and acknowledged gender equality as one of the key considerations in addressing climate change.
20. The Philippine Climate Change Commission (CCC), under the Green Jobs Act of 2016, was mandated to develop and administer appropriate standards for the assessment and certification of green goods and services, and green technologies and practices for the purpose of regulating the availability of incentives under the law. The CCC, in the development of said standards, engaged the Philippine Commission on Women as one of the key stakeholders to ensure that gender consideration is included in the certification process.

²³ Women and the Environment, Beijing Platform for Action (BPfA+20) Philippine Progress Report

²⁴ Section 40 of the Magna Carta of Women (RA9710)

²⁵ Revised Implementing Rules and Regulations of RA9729 as amended by RA10174

²⁶ RA10174

21. In January 2019, through Commission Resolution 2019-02, the Climate Change Commission resolved to strengthen gender-based approaches in the formulation and implementation of climate change policies, plans, programs, and activities in the country, including the generation of sex-disaggregated data and conduct of gender analysis. Moreover, it resolved to coordinate with agencies concerned in promulgating policies, directives, and initiatives supportive of the collaborative approach to accomplish the objectives of the Resolution.
22. The Land Bank of the Philippines (LANDBANK), as an accredited Direct Access Entity (DAE) to the Green Climate Fund (GCF), has approved in 2019 the Policies to Govern LANDBANK's Implementation of Programmes/Projects Supported by the GCF, in which is included the policy on Gender and Development. This policy issuance establishes LANDBANK's commitment to gender sensitivity, as well as gender responsiveness, and aims to highlight and promote the relevant national laws and regulations governing gender and equality in the implementation of GCF-supported programmes and projects. LANDBANK will take the necessary measures to ensure that proposed projects and activities covered under this policy issuance are aligned with national policies and priorities on gender.

Philippine contributions to International Gender and Climate Change

A. Support to Gender Decision of the UNFCCC

23. The Philippines has actively supported the development of a Gender Action Plan of the UNFCCC. In 2016, the Philippines, through a formal submission to the UNFCCC, proposed elements and guiding principles for the advancement of the Lima Work Program on Gender and Climate Change, including (i) development of skills and capacity-building training programs on gender and climate change for both UNFCCC Secretariat and State Parties; and (ii) mainstreaming a gender perspective in the Guidelines on National Communication, including financial commitments of Parties that are in line with women's human rights and gender equality.
24. At COP23 in 2018, Parties, including the Philippines, adopted a Gender Action Plan and invited the Secretariat and relevant organizations to undertake the activities under priority areas - capacity-building, knowledge sharing and communication, gender balance, participation and women's leadership, consistent implementation of gender-related mandates and activities, and gender-responsive implementation and means of implementation.

B. Designation of Gender Focal Points to the UNFCCC and IPCC

25. In 2017, the Philippines designated its National Gender Focal Point to the UNFCCC to assist with all gender-related decisions and mandates under the UNFCCC processes.
26. In 2018, the Philippines nominated two gender focal points to the Intergovernmental Panel on Climate Change (IPCC) Task Group on Gender, with the aim of developing a

framework of goals and actions to improve gender balance and address gender-related issues within the IPCC. The IPCC is the lead scientific body serving the UNFCCC.

C. Gender Balance in the Philippine Delegation

27. The Philippine Delegation to COPs is comprised of at least 40% women, including senior negotiators, experts, and technical staff.
28. The Philippine Delegation continues to enjoin developed countries to improve their mitigation targets, mobilize climate finance, and accelerate its flow as well as the development and transfer of technology.

D. Philippine Membership in the Green Climate Fund Board

29. The Philippines secured a seat as alternate member in the Green Climate Fund Board from 2019 to 2022, providing an opportunity to shape the policies of the Board and its funding decisions. Senator Loren Legarda serves as the Philippine representative, and most of her advisers are women.

Project Site Information

Initial sex-disaggregated data for population in the project sites have been identified as follows:

30. Tuguegarao City in Cagayan Province is a third-class component city in the Philippines with a population of 153,502 (2015 census) with 77,622 female and 75,880 male population. About one third of the population or 47,119 are considered highly vulnerable to hazards as these are aged 0-14 and over 65 years of age. It is the capital of the province of Cagayan and the regional and institutional center of Cagayan Valley (Region II) comprised of 49 barangays or villages, with a total land area of 144.80 km² at 30 meters elevation. Within the past three decades, its economy gradually shifted from agriculture to secondary/tertiary economic activities such as trading, commerce and services. The shift was ushered by Tuguegarao's role as the Regional Government Center and Center of Commerce in Northern Luzon. Tuguegarao City has been identified to be one of the vulnerable to severe wind impacts from 1971-2013, with extreme TCs of high wind speeds have become slightly more frequent.²⁷ TY Haima was one of the most disastrous TY that stuck Cagayan, affecting at least 1.5 million people and causing severe flooding which negatively influenced 10,100 households of the region. Damages to infrastructure is estimated around Php 7 billion plus the reported damage to government infrastructure that has reached to Php 46 million (Cagayan PDRRMC). Based on the NDRRMC's situation report published during 16-20 October 2016 (TY Haima), the following damages were reported: 304,553 families or 1,386,587 persons were affected in 1,836 barangays in Region II of which 198,385 families; (899,397 persons) in 792 barangays are residents of Cagayan, and 136,324 houses (25,388 totally and 164,324 partially damaged) were damaged.

²⁷ Cinco, T. A., de Guzman, R. G., Ortiz, A. M. D., Delfino, R. J. P., Lasco, R. D., Hilario, F. D., & Ares, E. D. (2016). Observed trends and impacts of tropical cyclones in the Philippines. International Journal of Climatology, 36(14), 4638-4650

31. Legazpi City is composed of 70 barangays and is a first-class component city and the capital of the province of Albay in the Philippines. It has a population of 196,639 (2015 census) broken down into 98,477 female and 98,192 male population. The children (60,779) and elderly (9,990) accounted for 70,769 of the total population. It has a total land area of 153.70 km² with 47 meters elevation. Legazpi is the regional center and largest city of the Bicol Region, in terms of population. For the last 63 years, this city has been one of the areas most frequently hit by TCs which entered PAR. According to the study conducted by Japan International Cooperation, approximately 70 ha get flooded 3-5 times per year by 1-day storm rainfall (~60mm/day). On the other hand, areas that are occasionally flooded are approximately 180 ha where floods occur once a year by 3-day storm rainfall (~200mm/day). During Typhoon Durina (Reming), an accumulated 466 millimeters of rainfall for a 12-hour record (daily rainfall) on 30 November 2006 was recorded on the day the widespread debris flow occurred. It was 40 years ago when similar amount of rainfall was last recorded in the Province of Bicol. Typhoon Durian (Reming) moved slowly over Legazpi and overwhelmed the area with rainfall intensity of 135 mm/hr (3:00pm hourly rainfall data). Per the 16 Dec 2006 report of the Bicol Provincial Disaster Coordinating Council (PDCC), 518 people died and some 648 missing, while 45,199 houses were partially damaged and 68,617 houses were totally damaged.
32. The Municipality of Palo is located in the north-eastern part of the province of Leyte with a population of 70,052 (2015 census) broken down into 34,082 female and 35,970 male population. Children numbered 23,340 while the elderly population was 3,132. Composed of 33 barangays, Palo was declared as third-class municipality in the province of Leyte, Philippines. While Leyte experiences a lesser number of TC frequency than Cagayan and Legazpi City based on 1951-2018 data, one of the strongest typhoons that hit the Philippines, Haiyan, significantly devastated Eastern Visayas, particularly the provinces of Leyte and Samar in November 2013. Typhoon Haiyan was the world's strongest typhoon in 2013, with a maximum sustained wind of 235 kph and gustiness of 275 kph that brought devastation of catastrophic proportions in its wake where more than 90 percent of homes and infrastructure in Samar and Leyte were destroyed and communication cut off due to strong winds. Preparing for storm surges induced by tropical cyclones is one of the most important challenges that many coastal areas in the world are currently facing. During the same event (TY Haiyan), a large-scale devastation struck Leyte with strong focus in the Municipality of Palo and Tacloban. According to the latest report from the NDRRMC, the total numbers of dead and missing due to the typhoon were 6,300 and 1,061, respectively, as of 17 April 2014. Most of the casualties were reported in two islands: Leyte (5,402 dead and 931 missing) and Samar (492 dead and 74 missing). The damage was largely caused by high winds and storm surge and storm waves induced by the typhoon.
33. The Municipality of New Bataan, a small agricultural town of mostly farmers on banana plantations, is situated north and west of Compostela Valley/Davao de Oro province with a population of 47,726 with 22,544 female and 25,182 male population. There were 15,265 children and 2,346 elderly. The municipality is also home to two indigenous communities, namely, the Mansaka and Mandaya tribes. These IP groups reside in the barangays of Cagan (2,062 people), Manurigao (1,729 people) and Pagsabangan (1,640 people) based on 2015 population data. It is surrounded with mountain ranges, and more than 50% of its territory is forest cover that has been the sources of living for its residents. Composed of 16 barangays, New Bataan is a first-class with total land area of 553.15 km².

Unlike the previous project sites, New Bataan was not regularly frequented by typhoons. However, with the recent Typhoon Pablo (international name, Bopha), a total of 612 people died due to landslide brought about by the heavy rains caused by the typhoon. The high winds and heavy rainfall resulted in landslides in hinterland. Barangay Andap was buried under a pile of rocks and boulders. Heavy rains brought by the typhoon caused flooding which carried eroded gravel, boulders, and other debris from the mountains slide down to the community (Lagmay et al., 2013). According to the situation report by NDRRMC on 25 December 2012, a total number of 711,682 families/ 6,243,998 persons in 3,064 barangays/ 318 municipalities / 40 cities / 34 provinces of Regions IV-B, VI, VII, VIII, IX, X, XI, XII, CARAGA and ARMM, of which New Bataan is situated, were affected. After the declaration of the State of National Calamity thru Proclamation No. 522, dated December 7, 2012, a total number of 4,567 (1,067 dead, 2,666 injured and 834 missing) casualties were reported with millions worth of damages to properties.

Capacity to mainstream gender-equality in the Project

34. The proposed GCF project will use gender mainstreaming as a strategy to ensure that its intended benefits to the community are both climate-sensitive and gender-responsive.
35. The Executing Entity, the Department of Science and Technology - Philippine Atmospheric Geophysical and Astronomical Services (DOST-PAGASA) under its Special Order No. 954 Series of 2014, reconstituted its GAD Focal Point System that is mandated to establish and strengthen GAD mechanism to catalyze and accelerate gender-mainstreaming within the agency. This includes the Grievance Committee serving in concurrent capacity as Committee on Decorum and Investigation (CODI) (Memorandum 2015-06-01), Adoption of Gender and Development and its related Policies in the Agency (Memorandum 2016-07-01), Establishment of GAD Office (Memorandum 2016-10-01), Establishment of Child-minding Station at the PAGASA Central Office (Memorandum 2016-10-02), Sex-disaggregation of data in all PAGASA activities (Memorandum 2016-10-03), and Institutionalization of Gender Analysis using the Harmonized Gender and Development Guidelines (HGDG) in Program Development, Implementation, Monitoring and Evaluation (Memorandum 2016-10-04).
36. DOST-PAGASA undertakes capacity-building efforts to ensure that all of its personnel can integrate GAD in their work, especially on this project. Since FY 2015, the following GAD activities were conducted with the participation of the DOST-PAGASA personnel:
 - Gender Sensitivity Training
 - Women's Month Celebration Activities (Film showing, street dance competition, purple wall, parades, attendance to PCW, CSC and DOST activities)
 - 18-Day Campaign to End VAW (Film showing, parades, attendance to PCW, CSC and DOST activities)
 - Anti-Sexual Harassment Seminar
 - Writeshop on Gender Analysis (Mid-Year and Year-End Assessment)
 - Harmonized Gender and Development Guidelines (HGDG) for GPB and ARs
 - Gender Mainstreaming and Evaluation Framework (GMEF) Workshop
 - DOST Orientation on Enhanced GMEF
 - Annual attendance to the DOST GAD Focal Point Assembly
 - Attendance to various DOST/PCW activities

37. As the GCF Accredited Entity for this project, LANDBANK's Gender Policy shall ensure the conduct of gender assessment in order for the project to identify gender issues and integrate into the context and socio-cultural factors underlying climate change-exacerbated gender inequality, with the aim of optimizing the potential contributions of women and men of all ages in building individual and collective resilience to climate change. This assessment shall be used to inform project formulation, implementation, and monitoring and evaluation to ensure that gender-responsive approach is adopted in the GCF projects. Equitable information-sharing with women and men shall be observed, with participation across sectors during stakeholders' consultations, and making the project truly people-centered by encouraging feedback and utilizing these for improvement of the MH-IBF-EWS project.
38. For the MH-IBF-EWS Project, the key gender issues in selected project sites shall be identified through stakeholder consultations and assessment. Initially, some gender inequalities in the status and condition of women and men, as well as other vulnerable groups, are as follows:
- Access to accurate weather information of women and men in communities have to be investigated, such as channel/mode of communication and how effectively it is relayed to the end users.
 - How the weather information received by the community is understood and perceived by women, men and other community members.
 - Women and men take on different roles and responsibilities relative to disaster and emergency response.
 - The ability of women and men to take action and respond to early warning through FbF and early actions should also be looked at.
 - Vulnerable groups, such as women, have limited access to and control over resources, especially in times of emergency and evacuation. Indigenous people (IP) communities tend to receive less information such as EWS due to distance and hard-to-reach location. Needs of women, men, children, elderly, PWD and other vulnerable sectors should be accounted for in the development of EWS, as well as in the design of facilities such as evacuation centers.
 - Integration of gender and women's concerns in policies and programmes on early warning and early actions should be done. Programme implementers and policy makers may lack gender awareness and skills in gender analysis.
 - The need to strengthen implementation of gender and development-related policies and strategies in the NCCAP and NDRRMP, and monitor their implementation.
39. A stakeholders' consultation was held in Legazpi City last July 5, 2019. In attendance were the city government officials, led by Mayor Noel Rosal, together with representatives from barangays (villages), citizen groups, and the private sector. Other project sites – Tuguegarao City; Palo, Leyte; and New Bataan, Davao de Oro – were likewise represented in the meeting.
40. During stakeholders' consultations, the participants have shared about their current emergency response actions and how they interact with government officials, both city and barangay levels. It is observed that city and barangay officials and representatives

are a good mix of women and men, and represent various different age groups. It may be noted that the participants were eager to share their experiences during typhoons and how they were able to cope with it. Group discussions allowed the participants to reflect on the existing protocols and past actions, and identify areas which need strengthening and improvement.

41. An EWS serves as a community's effective protection mechanism against natural hazards. However, there are several human related factors that must be taken into consideration. Some of these were raised and discussed among the stakeholders, and presented as follows:
42. **Information flow.** The city government plays a crucial role in the information flow from the national agency (DOST-PAGASA in the case of weather forecasts) to the end users. The City Mayor, through the DRRM Office of the LGU, sends out the weather alert to the heads of the barangay. Each barangay head cascades the message to the barangay councilors, which is in charge of a purok (smaller division of barangay/village). These, in turn, inform the heads of households. Weather information dissemination involves quad-media channels, text messaging, Facebook messenger group chat, phone calls and house visits, especially in times of imminent danger. Refer to Annex 13 for DOST-PAGASA's Information Flow.
43. **Understanding the weather information.** The delivery of timely and accurate weather reporting is an important component of an early warning system. But as highlighted during the especially strong TC events, notably that of Typhoon Yolanda (Haiyan), the critical part is the receiver's understanding of the information, believing it, and acting on it. Actions in accordance with provided recommendations enable the saving of lives, health and properties. This is the challenge facing DRR and EWS implementation.
44. Thus, it is necessary that messages on multi-hazard risk information be tailored to the needs and capabilities of vulnerable groups, targeting women, children, senior citizens and persons with disabilities (PWDs). Main hurdles in this communication channel include education level, knowledge of language in which warning is communicated, problems of hearing and seeing. For example, children and people with low education level may find warnings worded in an official and impersonal manner difficult to understand. For elderly citizens with the problems of hearing or seeing and living alone, they may be left out of reach when hazard risk messages are sent only through printed or electronic media. Ensuring that the language used, the wording and the channels used to convey the messages address these issues mentioned, so that people are able to adequately grasp the impending threats.
45. While a higher educational attainment of women is observed for the country in general, this has to be confirmed whether the same situation applies in the project sites. When women have received higher education status, they are more likely able to participate in decision-making of the community²⁸. This, in turn, allows for more participation of female headed-households as well as other vulnerable sectors.

²⁸ CARE International (2017). Does Gender Responsive Disaster Risk Reduction Make a Difference? A Comparative Study of Category 5 Tropical Cyclone Pam in Vanuatu.

46. Likewise, there may be differences in the perception of reliable information. While the official and media announcements are known and often believed by the general population, other people trust personal information sources, such as neighbors and family relatives. The communication channels utilized for this project should consider both knowledge sources to effectively target the vulnerable communities.
47. **Gender roles in emergency situations.** Roles and responsibilities of women and men vary relative to disaster and emergency response. Most families maintain the traditional family structure, where the men are the breadwinners and women are the homemakers. In addition, children are generally in the care of mothers or other female adults in the family. Hence, the project shall consider the various roles of the people in the community to ensure that timely and accurate weather information reaches them wherever they may be at that instance. This would include conducting awareness briefing and information dissemination in the homes, workplaces, in schools and community areas. As men are generally more risk tolerant than women, hence less prone to take self-protective actions. Men may regard evacuation calls as panic and do not react, staying behind to secure their property as a precaution. In contrast, women seem readier to respond to risk, but they also may be slow to react according to instructions until family members are secured.
48. In Philippine society, female-headed households are generally single mothers or wives of OFWs. Bearing the sole responsibility for her children, the female head is especially vulnerable as she needs to perform the task of two adults/ parents. Unless there are other adults in her household, such as grown children or other relatives, these women would need assistance from neighbors and the barangay to secure their family during emergency and evacuation events.
49. One of the reasons why people may not want to evacuate is that they don't want to leave their property unattended. Thus, they would secure their house/property first prior to evacuation. Following stereotypical gender roles, the usual case is that the father or a male adult is left behind to safeguard the home and their belongings, including the animals, while most of the household members proceed to the evacuation center. As such, these individuals are placed in a more vulnerable position in trying to look after their properties. The local government tries to address this by urging them to evacuate the danger area, even using force if necessary, to ensure the safety of these men who volunteered to be left behind.
50. **Taking action and responding to early warning.** Another consideration is the ability to take action and respond to early warning through FbF and early actions. Through a gender lens, women and men are able to respond in different ways upon receipt of weather warning to evacuate due to a typhoon or storm. Women tend to report actions centered around the home, such as preparing food and other necessities for evacuation. On the other hand, men usually take charge of activities outside the home, such as house strengthening and tree cutting. These reflects the established gender roles in the community.

51. Household members with special needs, such as the sick family members, elderly, pregnant or nursing mothers, newborn infants and children would require more time to prepare prior to evacuation. For such cases, barangay officials take note of these household with vulnerable members into account. At the time of an emergency evacuation, these households shall be given advanced warning, hence earlier lead time to attend to the needs of the vulnerable persons. In the evacuation centers, the city government tries to provide for vulnerable individuals, while also considering their other needs, i.e. to be with their own family members, privacy for nursing mothers and the elderly, etc.
52. **Addressing the needs of vulnerable groups.** In times of emergency and evacuation, women have limited access to and control over resources. In a traditional household, women serve as homemakers while the men are the breadwinners. Should an emergency occur, women are tasked to evacuate their children along with them. Their vulnerability increases in cases of pregnant or lactating mothers. This is where the assistance of the barangay local officials could help ensure that they are safely conveyed to the evacuation site, along with their children. Another possible thing to note is the number of women and men in the community who have driver's licenses, as well as access to/ ownership of vehicles, which can aid in their mobility during emergency evacuation. This may be addressed if transportation can be provided by the LGU or barangay, to help move women, children, the elderly and PWDs in the event of an emergency evacuation.
53. For vulnerable communities residing in hazard-prone areas, their situation is aggravated by the fact that their location is farther or hard-to-reach from the city center or downtown area, where most information is available/ received from government agencies. In the case for the IPs in New Bataan, the Mansaka and Mandaya tribes live in mountain barangays. Early warning information is coursing through the normal channels (from municipality to the barangay level), and yet there must be consideration for the specific needs of vulnerable communities. Traditional measures which IP groups undertake during disaster should likewise be documented and used alongside other communication channels. This is to ensure effective transmission of information, especially crucial in emergency situations. Another consideration would be the language used to deliver the weather warnings. While it is known that these IP groups speak and are able to understand the language of the region, delivering the message in their indigenous language may also help in reaching out to more individuals and could promote their engagement in EWS development. This will be assessed more thoroughly during the baseline assessment of the project. The municipality is aware of these issues and gaps, and hopes to address them through capacity building and training of the vulnerable IP groups in terms of early warning and early actions.
54. With the project aiming for a people-centric and -responsive EWS, it is envisioned to engage the community as early as the planning stages, and through the stages of project implementation. In order to do so, increasing the involvement of women, IPs and other vulnerable groups in disaster leadership allows for more inclusive preparedness and response.
55. **Cultural and personal beliefs.** While the communities in Legazpi City are more experienced in emergency response activities of the city government, some individuals

are more resistant and hesitant to follow evacuation advice despite the inclement weather. These may be attributed to each person's false sense of security and other cultural factors at work. One example cited was in the case of Typhoon Usman which occurred in December. Because of the Christmas season, more families preferred to stay in their homes than to evacuate during this time to spend time with the family.

56. It was mentioned during the stakeholders' meetings that some community members rely on traditional beliefs as a sign of danger or weather disturbance, such as observing changes in the behavior of farm animals. These individuals would sometimes wait for these signs before acting upon the threat or preparing for evacuation. While this could promote or delay action, depending on the circumstances, these and other beliefs and traditions should be taken into account in the development of the EWS.
57. **Integrating gender issues into the MH-IBF-EWS project.** The project aims for gender issues to be integrated into policies and programs. The MH-IBF-EWS project shall come up with manuals and protocols for early warming, and these should already have gender-responsive actions embedded in the activities. This will enable the project to not only influence national EWS efforts, but ensure that such measures are also considerate of gender issues which may be encountered in each community.
58. Important as it is to cascade programs which are already gender-sensitive, the roles of the project implementers and policy makers are thus equally crucial to guarantee its success. Capacity building of personnel under the project should introduce gender-responsiveness through the guidance of a gender expert. Gender awareness and skills in gender analysis should be strengthened in the implementation of the project activities. In turn, this will likewise strengthen the implementation of gender and development-related policies and strategies in the NCCAP and NDRRMP, and monitor their implementation.
59. Issues on gender which were raised during the stakeholders' consultation should be taken into consideration in the project implementation stage. These should also be accounted for when crafting policies and programs for early warning, FbF and early actions at the national and local levels. Strengthening the project's gender perspective should be addressed by providing adequate training for program implementers and policy makers in order to hone their awareness and skills in gender analysis. This would lend appreciation for the value that a gender lens can offer in the various stages of the project.

Philippine Laws for Women's Rights

60. In the area of legislation, the Philippine government recognizes the role and influence of women in the Philippines through the crafting of various laws to guarantee their protection and well-being. The following are some of the important laws passed covering Filipino women's rights in the country²⁹:

- **105-Day Expanded Maternity Leave Law**

²⁹ Philippine News Agency. (2019). List of laws protecting women in PH. Retrieved from <https://www.pna.gov.ph/articles/1063739>

61. Signed into law on February 2019 by President Rodrigo Duterte, Republic Act 11210 or the Expanded Maternity Leave Law extends the previous 60-day (78 days for caesarian section delivery for women workers in the private sector) paid maternity leave to 105 days. The law also entails an option to extend for an additional 30 days of unpaid leave. Additional 15 days paid maternity leave shall also be granted to female solo parents.

- **Prohibition on Discrimination Against Women**

62. RA 6725 prohibits discrimination with respect to terms and conditions of employment solely on the basis of sex. Under this law, any employer favoring a male employee over a female in terms of promotion, training opportunities, and other benefits solely on account of sex is considered discrimination.

- **Anti-Violence Against Women and Their Children Act of 2004**

63. RA 9262, or An Act Defining Violence Against Women and Their Children, Providing Protective Measures for Victims, Prescribing Penalties Therefor and for Other Purposes, recognizes the need to protect the family and its members particularly women and children, from violence and threats to their personal safety and security. Under this law, the state also recognizes the need to protect the family and its members particularly women and children, from violence and threats to their personal safety and security.

- **Assistance for small-scale women entrepreneurs**

64. This law seeks to provide all possible assistance to Filipino women in their pursuit of owning, operating and managing small business enterprises. RA 7882, or the act that states the Provision of Assistance to Women Engaging in Micro and Cottage Business Enterprises, and for other purposes, was approved in February 1995.

- **Anti-Sexual Harassment Act of 1995**

65. RA 7877 addresses the issue of sexual harassment committed in employment, education or training environment. It was signed into law on February 14, 1995, under former President Fidel Ramos' administration. Sexual favors made as a condition in the employment or granting promotions or privileges; or the refusal to grant the sexual favor results in limiting, segregating or classifying the employee which in any way would discriminate, deprive or diminish employment opportunities or otherwise adversely affect is punishable by law.

- **The Anti-Rape Law of 1997**

66. RA 8353 states that any person having carnal knowledge of a woman through force, threat, or intimidation or by means of fraudulent machination or grave abuse of authority will be punished. Depending on the severity of the case, the offense may be punishable reclusion perpetua or life imprisonment.

- **Rape Victim Assistance and Protection Act of 1998**

67. RA 8505 declares the policy of the State to provide necessary assistance and protection for rape victims. The government shall coordinate its various agencies and non-government organizations to work hand in hand for the establishment and operation of a rape crisis center in every province and city that shall assist and protect rape victims in the litigation of their cases and their recovery.

- **Magna Carta of Women**

68. RA 9710 is a comprehensive women's human rights law that seeks to eliminate discrimination through the recognition, protection, fulfillment, and promotion of the rights of Filipino women, especially those belonging in the marginalized sectors of the society. It conveys a framework of rights for women based directly on international law. Pursuant to this law is Executive Order 273 that states the approval and adoption of Philippine Plan for Gender-Responsive Development, 1995-2025.

- **National Women's Day**

69. RA 6949 declares the eighth day of March every year as a special working holiday. This ensures meaningful observance of the holiday, where all heads of government agencies and instrumentalities, including government-owned and controlled corporations as well as local government units, and employers in the private sector shall encourage and afford sufficient time and opportunities for their employees to engage and participate in any activity conducted within the premises of their respective offices or establishments to celebrate National Women's Day.

Gender Action Plan

70. To align with the national gender mainstreaming strategy, the implementation of project activities shall strive to become gender-sensitive in the conduct of capacity building and training activities in the target communities. This shall apply both in the technical training of forecasters, and in the IEC materials for the general public. Gender-neutral language shall be used in the preparation of training materials and in the dissemination of forecast warning information.

71. In building the project exposure database, sex- and age-disaggregated data will be collected to provide more relevant information in project monitoring and evaluation stages. The risk matrix for impact-based forecasting and early warning will also be inclusive, ensuring the participation of each gender, as well as other vulnerable groups.

72. The project will significantly provide social economic, environmental, as well as gender-sensitive development co-benefits. Gender and development strategies will be promoted and integrated to the interventions in order to contribute to identifying and addressing gender-based vulnerabilities in the project sites.

73. During stakeholder engagement activities, necessary measures will ensure that men and women are able to take part in developing measures to mitigate risks, that the project does not increase gender inequality and, that project benefits are optimized for women and men from vulnerable communities, ensuring the promotion of gender equality and non-discrimination.
74. During project implementation, equitable information-sharing with women and men stakeholders shall be the minimum standard, ensuring that information is both available and presented in accessible formats across all stakeholder groups. Existing communication channels shall be assessed to determine their effectiveness. Depending on the result, these may be retained and/or assisted by additional modes of communication to be introduced as the situation requires. Not only is the approach concerned with delivering the message, but a response mechanism shall be put in place. A two-way exchange will allow for regular feedback, ensuring that their views and priorities are incorporated into design and practice.
75. The MH-IBF-EWS Gender Action Plan is summarized below, keeping in mind that both men and women should have full and equitable access to the Project's resources and benefits, with specific actions and responsibilities aimed at ensuring the full participation of women in Project activities.
76. **Conduct gender-sensitive vulnerability assessment in the project sites.** Using existing and current information available in national agencies, the 2015 census data shall be analyzed to obtain available sex- and age- disaggregated data on social vulnerability with particular focus on the project sites and their provinces/ regions. These would include the data on employment and education; physical abilities, disabilities and related health problems; ownership of house, productive assets and farming opportunities; household composition information (ratio of dependent persons, single member households – male and female, women headed households, livelihoods, unpaid care and domestic work responsibilities). Likewise, households receiving state subsistence support, such beneficiaries of the government's conditional cash transfer program (locally known as 4Ps, Pantawid Pamilyang Pilipino Program) and other livelihood support programs shall be noted to analyze the social assistance database in the project areas.
77. Conducting group discussions and in-depth interviews with key stakeholders in the project sites, with the participants equally representing the various sectors: women, persons over 65, disabled or family members of disabled, community leaders and government officials. These meetings shall provide a venue for discussion of mapping hazards and risks, collecting data on existing community coping strategies, identifying local businesses and institutions able to contribute to DRM activities. To identify priority needs, responses to, separate coping mechanisms of women and men, elderly, disabled and poor. An initial stakeholders' consultation in Legazpi City was already held last July 5, 2019, where barangay heads and representatives were present. A similar and more focused meeting shall be organized at the start of project implementation to engage the community participation in each of the project sites.
78. **Collection of sex- and age-disaggregated data for project indicators.** As indicated in the project logframe (Annex 2a, Table 17), sex- and age-disaggregated data shall be

collected as applicable to the project indicators. In particular, this will involve Project Activity 1.6: *Build exposure database at the barangay level in project sites.*

79. Information from Activity 1.6 shall be integrated with other weather and risk information for Activity 1.8: *Develop a tool /methodology to undertake risk analysis incorporating hazard, exposure and vulnerability and assess socio-economic and gender vulnerability to identify potential impacts from extreme weather events in the project sites.* This will guarantee that gender composition of a community is considered in the preparation of the methodology to identify potential weather impacts in the area.
80. Under Project Output 3, gender-responsive approaches will be incorporated into the project implementation. Activity 3.2. *Build gender-sensitive institutional and technical capacities to implement MH-IBF-EWS* shall ensure that issues identified during the capacity gap assessment shall be used in formulating a gender-sensitive capacity building plan for targeted groups and in the development of training modules. Likewise, Activity 3.3. *Develop localized and people-centered impact and response tables for each hazard for the four project sites with active participation of stakeholders* seeks to develop a people-centered EWS by tailoring of messages according to the needs of end-users, identifying the best channels for dissemination, and collecting feedback to improve the system. Active participation of at-risk communities and affected populations will be sought to strengthen the development of solutions for the last mile.
81. **Gender-responsive disaster preparedness activities.** To ensure a people-centric EWS, consultation meetings shall be conducted at the start of the project attended by women and men of different age groups, and those from vulnerable communities. Plans for disaster preparedness and response shall be crafted based on gender analysis and keep in mind the gender considerations. Delivery of hazard information should be done through appropriate channels to reach out to women and men, and particular vulnerable sectors. Educational institutions and other community partners may be tapped to increase preparedness, with teachers, students, and other school staff receiving information on different types of disasters and on effective immediate response to them.
82. **Accessible EWS for the general public.** Apart from the normal, official channels of communication, the EWS shall be tailor-fit to gender-differentiated needs and capabilities of at-risk population groups, such as children, senior citizens, the sick, and PWDs. The EWS will utilize multiple methods in order to reach across a wide range of people. Various channels include: TV, radio, internet, SMS messaging, community bulletin boards, sirens, church bells, etc. as the community would see fit to their purpose. with clearly stated information verbally as well as through infographs. Special consideration shall also be extended to pregnant women, the elderly and disabled in emergency planning and evacuation.
83. Moreover, the project shall also ensure that weather warnings are provided in a language accessible to the target audience. This includes the actual language used (English and/or other Filipino languages/ vernacular in the project site) and the tone used: formal and official language vs. layman and conversational language. These details shall be identified during stakeholders' consultation at the onset of the project.

84. **Mainstreaming gender issues in MH-IBF-EWS.** Among the project outputs are manuals and protocols for early warming, with gender-responsive actions integrated into policies and programs. The project shall also account for the participation of vulnerable sectors, including IP communities, the sick, the elderly, among others. Capacity building activities shall be held under the guidance of a gender expert/ consultant to warrant the inclusion of gender considerations in project implementation.
85. **Strengthen capacity building of stakeholders in gender-responsive disaster risk reduction.** It is envisioned that the project would help increase gender awareness in the project sites, as well as improve skills in gender analysis of community officials. Similarly, the project shall strengthen the implementation of gender and development-related policies and strategies in the NCCAP and NDRRMP, and monitor their implementation.
86. **Encouraging equitable participation of stakeholders.** In various stages of project implementation, the stakeholders will be consulted in order to increase their participation and for them to take ownership of the EWS being devised. Engaging women and men, children and elders, IP groups (as applicable) as well as other vulnerable members of the communities, would make the project people-centric and responsive to the needs of the community.
87. **Gender training for project staff and personnel of partner agencies.** In order to guarantee the success of the implementation of the project's gender action plan, the project staff should have undergone gender and social vulnerability sensitive training. Same goes for the EEs and Co-EE personnel involved in the project activities. Moreover, the project shall enlist the services of qualified gender expert/ consultant, as well as an IP expert/ consultant, to better guide the team in addressing the social vulnerability issues in the project sites.

ACTIVITIES	DELIVERABLES	TIMELINE	RESPONSIBILITES
Impact Statement: <i>Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions, including women and girls</i>			
Outcome Statement: <ul style="list-style-type: none"> • <i>Increased generation and use of climate information in decision-making for women and men</i> • <i>Strengthened institutional and regulatory systems for climate and gender-responsive planning and development</i> • <i>Strengthened adaptive capacity and reduced exposure to climate risks of women, men and at-risk communities</i> 			
OUTPUT 1: Science-based multi-hazard and climate risk information is generated			
1.6. Build exposure database at the barangay level in project sites *Update exposure databases, including sex- and age-disaggregated data; capacitate LGUs, maintain and regularly update the databases.	Exposure database of project sites consisting of sex-disaggregated population data and building data	Year 1 Q1 to Year 2 Q2	DOST-PAGASA, DENR-MGB, LGUs of the project sites
1.8. Develop a tool /methodology to undertake risk analysis incorporating hazard, exposure and vulnerability and assess socio-economic and gender vulnerability to identify potential impacts from extreme weather events in the project sites	Risk information such as risk maps and national-scale risk matrix Tool/methodology for risk analysis for quantification of losses/impacts.	Year 1 Q3 to Year 2 Q2	DOST-PAGASA, DENR-MGB
OUTPUT 2: Established MH-IBF-EWS supported by a knowledge and decision support system.			
2.2. Develop/update early warning protocols from hazard to impact-based using collaborative approaches for the project sites *Protocols shall include responsive actions to address special needs of	Impact-based early warning protocols and SOPs for each hazard Documentation of protocols (e.g. manual)	Year 2 Q1 to Year 3 Q4	DOST-PAGASA, DILG, OCD, DENR-MGB

ACTIVITIES	DELIVERABLES	TIMELINE	RESPONSIBILITES
women, elderly, the sick, and other at-risk groups			
2.4. Testing and validation of impact and response tables of the project sites. *Testing and validation shall be participatory across sectors: women, men, elderly, children, IP groups, communities in hazard-prone areas, etc.	Protocols and SOPs on early warning, disaster preparedness, local early actions and response including FbA in project sites	Year 3 Q1 to Year 5 Q4	DOST-PAGASA, DENR-MGB, DILG, OCD,
OUTPUT 3: Improved national and local capacities in implementing people-centered MH-IBF-EWS and forecast-based early actions and financing (FbA)			
3.2. Build gender-sensitive institutional and technical capacities to implement MH-IBF-EWS. *Capacity building activities to be conducted for staff of partner agencies and LGU of project sites under the guidance of a gender expert/ consultant.	Gender-sensitive capacity development plan Training modules targeted for specific users Trained national government officials (e.g. DOST-PAGASA, DENR-MGB, DILG, OCD personnel) and 4 LGUs on MH-IBF-EWS	Year 1 Q2 to Year 4 Q4	DILG, OCD, DENR-MGB, WFP
3.3. Develop localized and people-centered impact and response tables for each hazard for the four project sites with active participation of stakeholders *Participatory workshops shall ensure various sectors are represented: women, men, elderly, children, IP groups, communities in hazard-prone areas, etc.	Impact and response tables that includes EAPs of the 4 project sites for each hazard using color codes corresponding to the different levels of risk (i.e. no action, be aware, be prepared, take action) User-agreed forecast and early warning messages that will be used for developing impact tables for each project site	Year 2 Q1 to Year 3 Q2	DOST-PAGASA, DILG, OCD, DENR-MGB, WFP, LGUs

ACTIVITIES	DELIVERABLES	TIMELINE	RESPONSIBILITES
	<p>User-agreed dissemination channels of forecasts and warnings</p> <p>Process documentation of the development of people-centered EWS to support the upscaling of MH-IBF-EWS nationwide</p> <p>Risk perception study</p>		
<p>3.4. Develop Early Action Protocols (EAPs) applicable to project sites including shock-responsive social protection with active participation of stakeholders.</p> <p>*Participatory workshops shall ensure various sectors are represented: women, men, elderly, children, IP groups, communities in hazard-prone areas, etc.</p>	<p>Triggers for FbA developed and agreed by all stakeholders</p> <p>Harmonized EAPs developed and calibrated in the project sites adopted by LGUs for each hazard</p> <p>Harmonized SOPs and operational plans at both national and local levels adopted by national and local government authorities</p> <p>Integrated early action protocols in local resilience plans (i.e. LDRRMP, LCCAP, disaster preparedness plan, contingency plan, and emergency operations plan)</p> <p>Climate-resilient livelihood options developed</p>	<p>Year 2 Q1 to Year 4 Q4</p>	DILG, OCD, DENR-MGB, WFP
<p>3.5. Formulate a communications plan, develop knowledge products and information, education and communication (IEC) materials on MH-IBF-EWS including FbA and conduct advocacy and outreach starting in project sites</p>	<p>Communications plan for MH-IBF-EWS</p> <p>Knowledge products and IEC materials using different media and platforms (e.g. guidebooks, leaflets, posters, videos)</p>	<p>Year 4 Q3 to Year 5 Q4</p>	DILG, OCD, DENR-MGB, WFP

ACTIVITIES	DELIVERABLES	TIMELINE	RESPONSIBILITES
*Knowledge products and IEC materials shall be in easy-to-understand, gender-neutral language/s understood and accessible to the end-users.	Advocacy and outreach activities in the project sites and across the country using regular promotional activities and campaigns of different national government agencies		
OUTPUT 4. Mainstreamed climate risk information and MH-IBF-EWS in development policy and planning, investment programming and resilience planning at national and local levels and institutionalized a people-centered MH-IBF-EWS in the Philippines.			
4.1 Enhance existing manuals and guidebooks on integrating MH-IBF-EWS and FbA in national and local resilience planning processes	Enhanced manuals and guidebooks on local resilience planning that includes MH-IBF-EWS, FbF and EAs for the four (4) project sites.	Year 3 Q1 to Year 5 Q4	DOST-PAGASA, DILG, OCD, DENR-MGB
4.2 Strengthen national inter-agency operational coordination mechanisms at the national level to implement MH-IBF-EWS	Interagency committee on MH-IBF-EWS established Updated SOPs for each collaborating agency	Year 1 Q1 to Year 5 Q4	DOST-PAGASA, DILG, OCD, DENR-MGB, WFP
4.3 Develop multi-stakeholder partnerships at the national and local levels with all stakeholders for FbA and social protection	Task force/local committee on FbA established by the LGUs MoA on FbA signed by key actors TWG on FbA established	Year 5 Q1 to Year 5 Q4	DOST-PAGASA, DILG, OCD, DENR-MGB, WFP