Mitigating Climate Risks through Insurance and Non-Insurance Solutions

A case for the Local Government Unit of Las Nieves
Acknowledgments

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<tr>
<td>CBDRRM</td>
<td>Community-based Disaster Risk Reduction and Management</td>
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<td>CCC</td>
<td>Climate Change Commission</td>
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<td>CCRIF</td>
<td>Caribbean Catastrophe Risk Insurance Facility</td>
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<td>CDRA</td>
<td>Climate Disaster Risk Assessment</td>
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<td>COA</td>
<td>Commission on Audit</td>
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<td>CLUP</td>
<td>Comprehensive Land Use Plans</td>
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<td>CRI</td>
<td>Climate Risk Insurance</td>
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<td>DEM</td>
<td>Digital Elevation Model</td>
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<td>DENR</td>
<td>Department of Environment and Natural Resources</td>
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<td>DILG</td>
<td>Department of Interior and Local Government</td>
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<td>DOST</td>
<td>Department of Science and Technology</td>
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<td>DRRM</td>
<td>Disaster Risk Reduction and Management</td>
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<td>GIZ</td>
<td>Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH</td>
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<td>HLURB</td>
<td>Housing and Land Use Regulatory Board</td>
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<td>LCCAP</td>
<td>Local Climate Change Adaptation Plan</td>
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<td>LDRRMC</td>
<td>Local Disaster Risk Reduction and Management Council</td>
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<td>LDRRMF</td>
<td>Local Disaster Risk Reduction and Management Fund</td>
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<td>LDRRMO</td>
<td>Local Disaster Risk Reduction and Management Fund</td>
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<tr>
<td>LDRRMP</td>
<td>Local Disaster Risk Reduction and Management Plan</td>
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<tr>
<td>LGU</td>
<td>Local Government Unit</td>
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<td>MFP</td>
<td>Microfinance Institution</td>
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<td>MSME</td>
<td>Micro, Small, and Medium Enterprises</td>
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<tr>
<td>NDRRMC</td>
<td>National Disaster Risk Reduction and Management Council</td>
</tr>
<tr>
<td>NDRRMF</td>
<td>National Disaster Risk Reduction and Management Fund</td>
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<tr>
<td>PAGASA</td>
<td>Philippine Atmospheric, Geophysical and Astronomical Services Administration</td>
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<tr>
<td>PCRIC</td>
<td>Pacific Catastrophe Risk Insurance Company</td>
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<tr>
<td>PHP</td>
<td>Philippines Pesos</td>
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<td>PIRA</td>
<td>Philippines Insurers and Reinsurers Association</td>
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<tr>
<td>PPIP</td>
<td>Provincial Parametric Insurance Program</td>
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<td>RFPI</td>
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Executive Summary

This report tries to map out a variety of challenges and solutions related to the provision of climate risk insurance (CRI) by the municipality of Las Nieves in the Philippines. It carries out a detailed discussion on the potential insurance and non-insurance solutions, coupled with an action-led approach on implementing the recommendations related to the climate risk protection mechanism.

The Philippines, being an agricultural economy, not only remains directly exposed to the adverse effects of climate risks, but also often suffer significant losses in terms of productivity, loss of life, loss of production, etc. Usually the low-income households and micro, small and medium-sized enterprises (MSMEs) are more affected by climate-related risks, thus bringing enormous economic damage to the whole economy.

To protect the local low-income households and MSMEs, one of the possible ways is to work with the local government units (LGUs) and stakeholders in the insurance industry, and develop the risk transfer solutions, including insurance and non-insurance solutions.

In addition to suggesting the integration of CRI into the Disaster Risk Management (DRM) policies of the LGUs, various important insurance products have been proposed here. These products, however, remain open to customization to the specific needs of the LGU.

Using the data and any relevant findings from the Climate Disaster Risk Assessment (CDRA) approach, the risk areas have been identified. Although there has been a variety of hazards identified by the LGU in its CDRA, our focus has remained on the priority hazards, namely the Floods, Drought, and Ground shaking. The data needs, along with their description, and the possible sources/method of determination have been identified for all these selected hazards (see chapter 4).

As an entry point, it is suggested that the detailed risk/vulnerability profiles of the LGU needs to be compiled, which will help in documenting all hazards, their vulnerabilities, and the risk exposure, such that:

- **Hazard identification**, which will be the profiling of all risks faced by the LGU;
- **Exposure and Vulnerability**, which will describe as to what needs to be insured, such as the property, crop, lives and livelihoods, etc.; and
- **The option of Risk Transfer**, which will suggest what are the suitable insurance and non-insurance options for the risk transfer available to the LGU.

The limitations in the CDRA approach have also been identified and solutions have been recommended to overcome those limitations. These limitations include the limited and qualitative information only, the obliviousness of priorities, non-availability of historical loss data, and lack of precision in the data (see chapter 1).

In order to calculate the overall risks faced by the LGU, the approach has been chalked out to look into the variety of factors, which will then help the LGU in exploring the DRM options. For example, by looking at the:
- **Hazard**: frequency, severity, duration, geographical extent, etc.;
- **Exposure**: building construction type, occupation, protection, age, location, etc.; and
- **Vulnerability**: what is the interaction between the hazard and exposure in areas such as the loss of life, injuries, extent of damage to building structures and movable property, loss of crops, and impact on business, etc.

Following this, first the suitable DRM approach has been suggested as to how the climate risk exposures can be minimized by the LGU, which will help in bringing down the values of the maximum probable losses and thus, lowering the costs of insurance premiums. Second, the suitable mechanisms for climate risk modelling for suitable insurance products has been suggested. Third, the approach for alternate risk transfer has been recommended where insurance is not a viable option. Where insurance is unviable, there is a chance that people as well as the LGU will get unreasonably burdened in the events of unforeseen economic losses. This situation is exacerbated when the risks are simply uninsurable due to their frequency or severity or prohibitive insurance premiums (see chapter 1).

The nature of insurance cover and the level of protection may depend upon the contingent needs of the households and MSMEs in the jurisdiction of LGU. As a starting point, following types of insurance covers may be considered:

- **Insurance for MSMEs**
  - Property
  - Business interruption
- **Insurance for households**
  - Property
  - Livelihood and income protection

After a careful comparison of the different types of insurance solutions, ranging from the parametric to indemnity-based insurance, an insurance solution based on parametric insurance is being recommended. Since the overall objective is to provide a mechanism for rapid access to post-disaster funds, which can help in early recovery in a cost-efficient/time-efficient manner, this will be possible once a parametric insurance vehicle is developed (see chapter 5).

Also, by combining the benefits of macro level (LGU-level) insurance policy with the micro-level product options, especially for the delivery of insurance benefits at the grassroots level, it is proposed that all MSMEs and low-income households within the jurisdiction of the LGU to have access to insurance to insure their property and income. This means that the main insurance policy will be held at the macro level but the households and MSMEs within the jurisdiction of LGU will be enlisted as the beneficiaries at the micro-level (see chapter 5).

At the macro-level, the LGU can be the policyholder for insuring against the defined risks. They can have multiple options of protection, such as protecting the households and MSMEs. This may include:

- Direct cash assistance for loss of income and sustainability of livelihood; and
- Indirect cash assistance to help in reconstruction of houses and damaged property.
This parametric insurance cover should be offered through an LGU-level risk pooling arrangement, whereby all climate-related risks will be consolidated for all barangays at the level of the LGU. This LGU-level insurance arrangement is recommended to be carried out in conjunction with the existing Disaster Risk Reduction and Management (DRRM) Fund of the LGU, which will be a common structure to collectively buy insurance for protecting the households and MSMEs in the LGU’s jurisdictions (see chapter 5).

This pooling arrangement will also help in layering of the risks, by creating at least two layers, one for the insurable risks, and another layer for the risks which cannot be insured or are financially unviable to be insured (see chapter 5).

One of the recommended products is the Property Insurance, whereby the LGU is recommended to start with getting the insurance for the houses and building properties of the low-income households and MSMEs in its jurisdiction. To know the financial value of such assets, one of the proxy measures to estimate their value could be to find out the minimum and maximum value of such assets, which will provide a potential range of sum insured, and then the LGU can decide upon an average value as the sum insured to protect the properties of such low-income households. This will protect against the risks such as Floods, Drought, and Ground shaking (see chapter 5).

The other recommended product is the Livelihood and Income Protection Insurance, which will be for the vulnerable population of the LGU, especially the low-income households, which are more prone to climate risks. This product will help in protecting the livelihoods of vulnerable low-income individuals by providing swift cash payouts following extreme climate risk events (see chapter 5).

The insurance products are recommended to be designed to cover different layers of risks: the "Large size risks (High risk layer)”, which will be meant to provide protection against extreme weather events, which are less frequent but extremely severe. The “Medium size risks (Low risk layer)” will be meant to provide protection against climate disaster events that are quite frequent in their occurrence but mostly less severe in nature. In such scenarios, it is important to look at options as an alternative of insurance. There may be a variety of possible solutions and options to address such scenarios (see chapter 5).

Despite the fact that various municipalities may face unique and different risks from one another, the LGU can manage the economic losses due to climate risks at a broader level. This means that there should be a risk protection mechanism at LGU-level. One of the possible options is the utilization of the existing mechanism of the DRRM Fund available at the LGU-level (see chapter 5).

The common and prominent distribution channels of MFIs and cooperatives is recommended to be used, as these channels usually have a high capacity to engage with and raise awareness among the low-income households and MSMEs, since they already operate in the communities and enjoy trust among their customers (see chapter 5).

Having a Nat Cat model for the whole jurisdiction of LGU will help in deciding upon the risk transfer needs, through insurance and reinsurance. The output of such model will be in the form of a probabilistic loss distribution, whereby the Probable Maximum Loss and the
Average Annual Losses will be calculated from such loss distribution. When a climate disaster will occur, the Nat Cat model will calculate an estimated loss amount. If this loss amount exceeds a pre-determined level, or trigger point, it will lead to an insurance payout for the LGU (see chapter 6).

There are certain general recommendations being made for the LGU, such as taking the risk reduction measures, ensuring the availability of sites for relocation/rehabilitation, improving the quality standards of construction, and deployment of early warning systems (see chapter 7).

A continuous revenue and funding stream will be required by the DRRM Fund to support insurance and build its reserves which are sufficient enough to continue providing the DRM and insurance activities. A five to ten-year roadmap may be developed in consensus with key stakeholders by setting up short-, medium- and long-term goals to gradually manage the financial liability (see chapter 7).

To facilitate the innovative climate risk insurance products, the insurance regulatory framework has to be less restrictive and allow non-traditional interpretations of the law, not being limited to the traditional indemnity-based insurance products. The parametric insurance products have to be allowed by the regulators as the valid insurance contracts (see chapter 8).

There has also been a discussion about the non-insurance solutions, which will be necessary for such parts of the risks which cannot be insured or are unviable to be insured. For this, it is recommended to utilize the DRRM Fund at the level of the LGU, which will work as a layered-reservoir for risks which cannot be transferred to the insurance companies (see chapter 9).
Chapter 1. INTRODUCTION

The Southeast Asian economy of the Philippines is considered as agricultural country. Not only are they directly exposed to the adverse effects of climate risks, they often suffer significant losses in terms of productivity, loss of life, loss of production, etc. In general, due to their limited risk management and absorption ability, the low-income households and micro, small and medium-sized enterprises (MSMEs) are more affected by climate-related risks, although their individual losses also add up to enormous economic damage for the entire economy. This creates a strong need to develop and devise a mechanism to establish and support climate risk insurance (CRI) for the vulnerable target market, including the low-income households, the MSMEs, etc., which are exposed to various climate-related risks.

One of the possible ways of doing this could be to work closely with local authorities responsible for disaster risk management and adaptation, such as the local government unit (LGU) and stakeholders in the insurance industry. Here, the main objective remains the development of CRI products and the relevant risk models to support the provision of insurance products for low-income households and MSMEs in the vulnerable target communities.

Recently, the Climate Disaster Risk Assessment (CDRA) process was mandated to be carried out for the municipalities in the Philippines as an instrument to informing the Disaster Risk Management (DRM) planning processes of the LGUs. Here we review the DRM measures, including the ones recommended in the CDRA, to be taken by the respective LGUs, and what the LGUs can do to minimise their exposure to climate risks.

As we aim to explore the advantages of insurance as the risk transfer option, the alternative risk transfer methods (other than insurance) are also being explored and discussed to identify solutions for risks that cannot be significantly reduced, mitigated, absorbed, are uninsurable, or simply unviable to be insured.

It also needs to be underlined that one key objective of GIZ RFPI III is to facilitate the integration of CRI into the DRM policies of the Philippines. A previous analysis has demonstrated that this objective can be achieved mainly by integrating the CRI in the DRM planning documents and investment plans of the LGUs.

It is expected that the initial work done based on the analysis and assessment of CDRA data, will be used as guidance for replicating the approach in more municipalities in line with the decision of the National Task Force (NTF). It will be the further discretion of the NTF, setup

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1 The climate risks are the natural disasters that affect vulnerable households, entrepreneurs, smallholder farmers, due to natural climatic effects. To address these challenges, the Climate Risk Insurance (CRI) is a form of insurance solution which can work at the macro, meso, and micro-level and aims to provide coverage against climate risks.
with the initiative of GIZ-RFPI, to decide on further measures and constructive interventions to be made in these municipalities and beyond, in contributing to a thorough, nationwide DRM and CRI integration approach.

1.1 Objective and Approach

Analysing the CDRA findings will mainly result in identifying the risk areas and addressing them in multiple ways.

Firstly, by suggesting the ways DRM approach can be followed and how risk exposures can be minimized by the LGU. Lowering the risk exposure will help in bringing down the values of the maximum probable losses and thus, the costs of insurance premiums.

Secondly, the objective is to develop a mechanism for climate risk modelling and help in the design of suitable insurance products for risks which cannot be mitigated and need to be transferred to the insurance companies.

Thirdly, the objective will progress by exploring the approaches to alternate risk transfer, in cases where insurance is not a viable option.

Figure 1: The step-up objective approach

To process this aim, the risk profile of the LGU has to be compiled, which will help in documenting all hazards, their vulnerabilities, and the risk exposure. As an entry point, the analysis of the risk data from LGU has been carried out to enable recommendations for insurance products as well as for prioritizing the investment decisions for DRM projects to be undertaken by the LGU.
Before we can move on to describing different CRI product design options, the exact nature of risks has to be defined. For example, one needs to look at the nature of the subject matter which needs to be insured, such as the property, the crop and agriculture produce, the lives and livelihoods, productive assets, etc. This is discussed in the subsequent sections.

1.2 The Climate Disaster Risk Assessment (CDRA) Approach

As mentioned above, it is understood that certain CDRA exercises have recently been carried out already in the municipality of Las Nieves. According to the Philippines government’s website, the CDRA is a decision-making tool critical for risk prevention and reduction, which leads to an agreed output that informs LGU decision-making on climate action specifically for the preparation of Local Disaster Risk Reduction and Management Plan (LDRRMP) and Local Climate Change Action Plan (LCCAP). The CDRA reports carried out for various municipalities may be available separately, although such reports have not been written or compiled by us.

1.3 General limitations of CDRA of selected LGUs

There are certain limitations identified while analysing the CDRA data of the LGU. These include:

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<th>S.No.</th>
<th>Limitation Type</th>
<th>Description</th>
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| 1     | Limited and qualitative information only            | The CDRA data provides only high-level information of several barangays in the jurisdiction of the municipality but do not mention the financial valuation of the expected losses.  
       |                                                     | It is critically important to have financial risk information, without which the insurance premium price cannot be worked out.                                                                              |
|       |                                                     | The currently available CDRA dataset may have some pieces of useful information regarding the hazards and vulnerability; the same information may not be sufficient from the insurance point of view. |
|       |                                                     | For example, a municipality may have the data pertaining to the risk maps with the description of hazards (floods, droughts, etc.) and exposure and vulnerability of various elements (population, critical facilities, urban use, economic use, roads, electric post, and water source). Without the financial values of these assets and reconstruction costs, it may not be possible to quote the values of sum insured and premium. |
| 2     | Oblivious priorities                                | Also, the CDRA data does not clearly spell out the protection priority needs and its decision as to what needs to be insured.                                                                               |
| 3     | Non-availability of historical loss data            | There are significant constraints in terms of data availability, as possibly there is a non-availability of historical data regarding the losses due to past natural disasters. |
| 4     | Lack of precision                                   | The dataset does not include the full event loss information, along with the risk-wise loss details.                                                                                                    |
|       |                                                     | Having such information will not only help in calculating the average loss figures for every location, but will also help in ascertaining the standard deviation of average loss per location. |
|       |                                                     | This will also help in designing and developing the financial models on the probabilities of named hazards, calculating the loss projections based on probabilities of certain scenarios, and calculating the risk premium or price of insurance covers according to the scenarios. |
1.4 Possible gaps in CDRA and their solutions

In addition to the general limitations of CDRA, there are certain gaps, which are not necessarily specific to the LGU of Las Neves but will be good to know for them, while analysing the CDRA data. These include:

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<tr>
<th>S.No.</th>
<th>Gap area</th>
<th>Gap description</th>
<th>Solution/ Recommendation</th>
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<tbody>
<tr>
<td>1</td>
<td>Post disaster-financing</td>
<td>Usually, a small percentage of the total population in the municipalities has been reported to be having the access to post disaster financing. Although it is not clear as in what is the nature and extent of such financing, but there is clearly a gap that not all or majority of the population has access to such disaster financing options.</td>
<td>Suitable insurance products can be developed to provide people with access to immediate post-disaster financing. Details to be discussed in subsequent sections.</td>
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<td>2</td>
<td>Ability and willingness to relocate and retrofit</td>
<td>Usually, there is only a small percentage of people and households who have the financial capability to relocate themselves or get the retrofitting of their lost properties. However, majority of the households have no means of relocation. Such households may have the willingness to pursue relocation if there is assistance provided from the LGU, although the government does not seem to have enough financial resources to support the relocation of all affected families or individuals. The local residents understand the importance of retrofitting and relocating in a post-disaster situation, hence show a greater willingness to do so. However, most of them do not possess sufficient resources. In contrast, generally, the commercial land area owners show lesser willingness to retrofit and relocate in a pre or post disaster situation.</td>
<td>The insurance coverage should include an option to provide financial assistance for relocation, in case of any climate-related disaster.</td>
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<td>No.</td>
<td>Topic</td>
<td>Description</td>
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<td>3</td>
<td>Jobs and livelihood</td>
<td>Generally the municipalities do not have enough means to offer jobs and livelihood to people after a climate disaster. The insurance product to cover the risk of business interruption, loss of income and livelihood.</td>
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<td>4</td>
<td>Limited access to insurance</td>
<td>Majority of barangays do not have access to any suitable insurance coverage. Insurance penetration remains low and there are hardly any residential or commercial properties covered by insurance. Issues need to be explored as to what are the reasons for inaccessibility to insurance. Issues including the suitable products, distribution channels, etc. need to be resolved.</td>
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<td>5</td>
<td>Limited insurance of public infrastructure</td>
<td>Usually only a small percentage of critical public infrastructure is insured under the property insurance category. Also most of the existing bridges and roads do not have insurance coverage; hence most of the post-disaster damage is repaired by using the local government funds or other sources. Financial and risk valuation of the exposure of public infrastructure will help in describing a suitable insurance coverage.</td>
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## NON-INSURANCE RELATED

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<th>Risk reduction measures</th>
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<td>6</td>
<td>Usually the local government does not seem to have enough ex ante resources to invest in risk reduction measures and support the pre-disaster building of infrastructure which could minimize the impact of climate-induced risks.</td>
<td>It is recommended that a portion of funds should go into the pre-insurance risk reduction measures.</td>
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<th></th>
<th>Lack of availability of sites for relocation</th>
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<td>7</td>
<td>Usually majority of the barangays do not have available alternative sites for the relocation of affected families or individuals to susceptible hazards.</td>
<td>Suitable sites should be identified where the post-disaster relocations can take place.</td>
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<th>Limited government resources</th>
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<td>8</td>
<td>The government resources are limited due to insufficiency of funds. In addition, commercial establishments may not be covered by government resources. The LGUs have limited resources to support risk mitigation measures to local infrastructure or facilities.</td>
<td>Government should work to mobilize resources, part of which can go toward risk reduction measures, while part can be used for insurance coverage. A detailed risk layering plan, along with the design of the insurance layers, needs to be developed.</td>
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<tr>
<th></th>
<th>Quality of construction</th>
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</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>At the moment, most of the residential structures and construction does not comply with the zoning standards, and may take a long time to do so.</td>
<td>Construction codes need to be followed in order to qualify for insurance, as well as reducing the risks which will also reduce the price of insurance.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Non-access to early warning system</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Usually a very small percentage of barangays have an access to early warning system to prepare against the possible impact of disasters and other undesirable events.</td>
<td>The early-warning system needs to be developed and implemented jointly with the meteorological department and LGUs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Agriculture dependency</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>The barangays within LGUs have limited access to agricultural services extension provided by the government. Not all of the barangays have alternative means of livelihood in case the agricultural harvests are affected.</td>
<td>Alternate economic opportunities must be explored and suitable risk reduction strategies should be put into place.</td>
</tr>
</tbody>
</table>
1.5 Strategic and operational foundations

Before we get into the discussion about the insurance and non-insurance solutions, it is important to explore and understand the key strategic objectives and the operational choices of the LGU. These are:

1.5.1 Strategic priorities

- **The goal of LGU is to protect the households and businesses against climate risks:** One of the main purposes for the LGU is to ensure their compliance to the guidelines by the Department of Interior and Local Government (DILG) on risk resiliency, using the CDRA approach as an instrument for Comprehensive Land Use Plans (CLUP), Local Disaster Risk Reduction and Management Plan (LDRRMP), and the Local Climate Change Adaptation Plan (LCCAP) planning documents. This way the LGU will also be able to justify the allocation of the LDRRM Fund (which is 5% of IRA) – traditionally meant to be spent on infrastructure, DRRM training, response, and rehabilitation. The overall strategic goal will be to integrate the CRI in the DRM planning documents and investment plans of the LGU.

- **Implementation of policy decisions:** One of the core objectives of the LGU is to serve the best interest of their people. To help the people be prepared with DRRM, the LGUs need to incorporate CRI in their DRRM plans. The LGU drive their mandate for implementing the policy decisions through the need for compliance to the national guidelines and to be able to use the DRMM-related budgetary allocations, which can be accumulated for usage for a period of up to 3 or 5 years. It is understood that there is general monitoring of DRRM plans (local and national), which reports back to DILG and office of the President. Often the LGUs need capacity building and advice from national office (HLURB for training and CCC for LCCAP planning) and other national agencies.

1.5.2 Operational direction

- **Protection scope:** The LGU has shown its priority to protect the vulnerable households and MSMEs from the risks due to climate. Specifically, these include the indigents (very poor), the farmers, microenterprises, senior citizens, disabled, youth, indigenous peoples, and women.

- **Risks to be protected against:** As per the CDRA guidelines, the LGUs are supposed to map nine hazards against the seven elements of interests (as applicable). These hazards and elements have been described in the subsequent section. There has been an indication of the priority of certain hazards, which includes the hazards of the flood, droughts, and earthquakes.

- **Premium payment:** If the suitable insurance products are on offer, then the question arises to who and how the insurance premium will be paid. The premium payment options will be explored subsequently, but it is expected that there are two potential
market segments here. First one is the microinsurance sector, which will be the market-based product offering where the client (end-user) will pay the insurance premium. In this case, the CRI products can also be bundled with other insurance or non-insurance products, using existing delivery channels, such as the rural banks, cooperatives, pawnshops, MFIs, consumer networks, etc. The second option will be to use the social protection programs, where the insurance premiums are subsidized or fully paid by the government. For example, here the LGU can allocate funds to pay for the premium and/or national agencies allocate funds.

- **Financial impacts and underlying issues:** In case where the end-users/customers directly pay for the insurance premium, a predetermined amount of cash assistance corresponding to the insurance policy’s sum insured value will flow to the households or the MSME, which can be used directly by the beneficiary. In case of the social protection segment, the claim amount will flow to the LGU or government agency (as being the policyholder), which can then be used for social services. Here the claim proceeds will be in addition to the regular budget of the LGU for social protection programs.
Chapter 2. THE SELECTED LOCAL MUNICIPALITIES

For the purposes of this report, one of municipalities has been identified and will be discussed in the following sections. This is the municipality of the Las Nieves, which is situated in the province of Agusan del Norte in the Philippines. Details are presented below.

2.1 About Las Nieves

The municipality of Las Nieves belongs to the Caraga region in the northeast of Mindanao. It is located in the hinterland of the province of Agusan del Norte, which has the population of approximately 354,000 people (as of 2015), excluding Butuan.

The Las Nieves is located landlocked in the remote southern part of the province. Its municipal area is divided into 20 regular barangays and a self-proclaimed tribal barangay (Lawan-Lawan). The municipality has a land area of approximately 580 square kilometres, and according to the 2015 census, around 28,400 inhabitants, spread over approximately 5,600 households, and a population density of 49 inhabitants per square kilometre. It has an annual population growth rate of 1.08%, and with this annualized growth rate, the current population is estimated to be 31,065 (in 2020).

According to the 2015 Census, those aged 15 up to 64, roughly, the economically active population and actual or potential members of the workforce, constitute a total of 56.05%. The median age of the population in Las Nieves is 20 years, with a poverty incidence rate of about 46% in 2015.

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4 Caraga, officially the Caraga Administrative Region or simply known as Caraga Region and designated as Region XIII, is an administrative region in the Philippines occupying the north-eastern section of the island of Mindanao. It comprises five provinces: Agusan del Norte, Agusan del Sur, Dinagat Islands, Surigao del Norte, and Surigao del Sur; six cities: Bayugan, Bislig, Butuan, Cabadbaran, Surigao and Tandag; 67 municipalities and 1,311 barangays. Butuan is the regional administrative centre.

5 See https://www.philatlas.com/mindanao/caraga/agusan-del-norte/las-nieves.html
Most of the population lives in the eastern part of the municipality, which is characterized by the lowlands along the Agusan River. The settlements on the banks of the river are mostly small villages surrounded by agricultural land. The main crops are rice, corn, and coconut. A hilly forested landscape describes the remaining 60% of the municipal area.

According to the Bureau of Local Government Finance, the annual regular revenue of Las Nieves for the fiscal year of 2016 was PHP 135.38 million.

When it comes to MSMEs, it is reported that there are a total of 128 micro enterprises in Las Nieves; however, the exact total number of SMEs is yet to be confirmed. The micro enterprise business activities in Las Nieves are concentrated in the barangays of Poblacion (23), Mat-i (19), Maningalao (16) and Lingayao (12).

Data about the potential financial exposure of these households and MSMEs is yet to be established, as well as details about what is traded or sold by these MSMEs in Las Nieves. Therefore one can only use the general estimates, for example, the Supplemental Guidelines on Mainstreaming Climate Change and Disaster Risks proposes to set PHP 8,672 in replacement costs per square meter of a business space.
Chapter 3. HAZARD, EXPOSURE, and VULNERABILITY

A hazard is an occurrence and severity of any particular potential disaster, such as a storm or flood, at a given location, within a specific time period. Hazards can be landslides, floods etc. producing losses to humans, buildings, properties etc. A hazard has a frequency of occurrence, which can be estimated.

The term exposure refers to the elements which may be at risk and which needs to be protected, such as the property values by location, which is also characterized by the building materials, typical uses, age, and replacement cost.

The vulnerability assesses the level of damage which would be expected at different levels of intensity of a hazard. For example, when a storm surge hits an area with buildings of lower-quality construction and limited flood mitigation measures, it is more vulnerable to losses as compared to an area that has strong flood control infrastructure and strong building regulations. The vulnerability may also include other impacts such as business interruption or loss of income.

In short, the risk can be considered as a product of hazard’s frequency, exposure, and vulnerability.

\[ \text{Risk} = \text{Hazard Frequency} \times \text{Exposure} \times \text{Vulnerability} \]

Figure 4: Relationship among Hazard, Exposure, and Vulnerability
In order to calculate the overall risk faced by the LGU, we need to look into a variety of factors, which will then help in exploring the DRM option. For example:

- **Hazard**: frequency, severity, duration, geographical extent, etc.;
- **Exposure**: construction type, occupation, protection, age, location, etc.;
- **Vulnerability**: what is the interaction between the hazard and exposure in areas such as the loss of life, injuries, damage to building structures and movable property, loss of crops, and impact on business;

### 3.1 Specific hazards identified

This report helps in identifying as to what extent the existing CDRA data and other data sources for the municipality of Las Nieves allow assessing the risk and the consequences of floods, droughts, and the earthquakes.

Overall, it can be said that the availability of data is scattered, concerning various hazards and their respective effects on the people and businesses in Las Nieves. In general, the CDRA data shows that 14 out of 21 barangays are at a variable degree of risk of flooding, while almost all barangays are at the risk of earthquakes. However, a more detailed access to the information within the scope of the CDRA dataset on the hazards and possible damages are only available for hazards related to river floods and droughts.

Figure 5: Geo Hazard mapping for Las Nieves
Agusan River is the country's third-largest river (after Cagayan River and the Rio Grande de Mindanao) with a total drainage area of 11,937 square kilometres and an estimated length of 349 kilometres from its origin.\footnote{For further information, see: http://now.minda.gov.ph/agusan-river-basin/}

According to the CDRA data, all barangays in Las Nieves are the areas that are prone and frequently affected by flood events. This means that a flood of up to two meters in height must be expected every 1 to 3 years.

For the purposes of this report, our focus will remain on three hazards, namely, the floods, the drought, and the ground shaking, in case of the LGU of Las Nieves.

### 3.2 Risk elements

Just like the hazards, the CDRA data also explores a variety of elements at risk within the jurisdiction of the LGU. In terms of population, assets, structures, and economic activities, the CDRA report focuses on the main areas by considering them as the primary elements at risk. These elements have been described below in detail.

![Figure 6: The main Risk Elements](image-url)
**Population**

The Population means the location and number of potentially-affected individuals for each identified hazard. This will include:

- No. of affected household and population
- % of informal settlers
- % living in dwelling units made of light materials
- % of young and old dependents
- % of household below poverty threshold
- % of malnourished individuals
- access to post-disaster financing
- access to public health insurance coverage
- household's financial capacities to relocate or retrofit
- government’s capacity to generate jobs

![Image: Useful data about Population to ascertain the risk](image)

Having the above mentioned precise data will help in understanding whether a certain barangay will be potentially affected by the impacts of hazards by analysing the information on the exposure, vulnerability, and adaptive capacity. Eventually, the information will help in deriving from the data provided by the LGU through barangay-level CDRA and the Community-based Disaster Risk Reduction and Management (CBDRRM).

**Urban Use Area**

The term “Urban Use Area” means a location in the municipality’s jurisdiction which is used as residential, commercial, industrial, or for other urban purposes. The data will help in analysing in terms of the total land area allocated and its replacement cost by land use category.

The vulnerability of the building structures will help in assessing in terms of:
The adaptive capacity by land use category was assessed on the indicators which include insurance coverage, availability of alternative sites, the capacity to relocate or retrofit structures, and whether the government has available resources for risk reduction measures.

**Critical Point Facilities**

The Critical Point Facilities means essential services such as the schools, hospitals or rural health units, local government buildings, and other related facilities, which provide key socio-economic support services to the locality. The exposure indicators include:

- the floor area
- number of stories
- the replacement cost

Discussion about the insurance protection of critical point facilities is beyond the scope of this report.

**Lifeline Utilities**

The Lifeline Utilities means critical facilities such as the water and power distribution, which is significantly important for daily lives in the municipality and to ensure efficient delivery of essential services.

Discussion about the insurance protection of lifeline utilities is beyond the scope of this report.
Chapter 4. RISK MODELS and DATA GATHERING

By looking at the “Hazards” and the “Elements at risk” as identified in the previous chapter, we have tried to extrapolate the possibility of developing the Risk Models here. However, before delving into the details of risk models, one has to prioritize the risks faced by the LGU. It is noted that the provinces where the LGU is situated face a varied level of risks against the identified hazards.

The hazards that will remain the priority of our discussion include the Ground shaking (earthquake), Drought, and the Flood. If needed, the hazard of Flood can be further divided into three types i.e. Flash flood, River flood, and the Coastal flood.

The following table shows varied levels of severity of various hazards in the province of Agusan Del Norte (where Las Nieves is situated). Higher number means more severity.

Table 3: Hazard severity levels in Agusan Del Norte

<table>
<thead>
<tr>
<th>Province</th>
<th>Earthquake</th>
<th>Tropical cyclone</th>
<th>Flash flood</th>
<th>River flood</th>
<th>Coastal flood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agusan Del Norte</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

The most common three risks faced by Agusan Del Norte (Las Nieves), in the order of high to low severity, include River flood, Flash flood, Earthquake, the Tropical cyclone, and the Coastal flood.

This means that the risk of River Flood is severely high, and is likely to affect a significant proportion of the population as these are spatially expansive. Earthquake may also inflect material damage to property, crop, and livelihoods in these locations. Given the extent of this exposure, the development of risk transfer products for a drought, earthquake, and flooding, is expected to provide a significant boost to the livelihood resilience.

After identifying the hazards and their severity levels which may potentially impact the selected municipalities, the following risk models are being developed. Considerable support in arriving at these models has been driven by CDRA input data tables, extrapolated with external data sources, and expert assistance. These have been discussed below.

4.1 Flood Model

Generally, the flood is considered as an overflow of water that submerges land that is usually dry otherwise. In the sense of “flowing water”, the word may also be applied to the inflow of the tide. Flooding may possibly occur as an overflow of water from water bodies, such as a river, lake, or ocean, in which the water overtops or breaks levees, resulting in some of that water escaping its usual boundaries or it may occur due to an accumulation of rainwater on the saturated ground in case of an areal flood.
While the size of the body of water will vary with seasonal changes in precipitation, these changes in size are unlikely to be considered significant unless they affect humans, property, crops, or domestic animals. It is possible that the floods occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends or meanders in the waterway.

Floods usually cause damage to homes, crops, farms, etc. if they are in the natural flood plains of rivers. The riverine flood damage can be eliminated or by moving away from rivers and other bodies of water, however, it is difficult to settle people away from water as traditionally they have lived and worked by rivers due to the land being flat and fertile, and because rivers provide easy travel and access to commerce and industry.

Some floods develop slowly, while others can develop in a short time, such as few minutes, and without any visible signs of rain. Additionally, floods can be local, impacting only a local barangay (neighbourhood) or community, or very large, affecting entire river basins.

### 4.1.1 Understanding the Flood Hazard

The meteorological station in the jurisdiction of the LGU usually shows data of monthly rainfall level for a vast time period. For example, let’s look at the data given below, which shows that in November 1972, the rainfall level was 404.8 mm\(^7\). Some of the possible reasons for this could be that:

- The total daily rainfall during November 1972 was 404.8 mm, which means an average of 13.5 mm rainfall per day. This might not be a plausible case for insurance, as such low levels of rain are seen to be normal and due to warm temperatures, the water will evaporate quickly, without causing significant losses to buildings or humans; or

- Just in one day rainfall, which produced a rainfall level of 404.8 mm in that day and no other rainfall during the month of November 1972. This case should be interesting for insurance.

#### Table 4: Monthly rainfall data (in mm)

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td>814.2</td>
<td>149.4</td>
<td>321.7</td>
<td>203.6</td>
<td>156.2</td>
<td>248.3</td>
<td>102.7</td>
<td>184.7</td>
<td>146.1</td>
<td>189.4</td>
<td>404.8</td>
<td>343.5</td>
</tr>
<tr>
<td>1973</td>
<td>107.7</td>
<td>111.5</td>
<td>128.6</td>
<td>64.2</td>
<td>62.1</td>
<td>146.9</td>
<td>203.3</td>
<td>134.7</td>
<td>164.3</td>
<td>396.6</td>
<td>404.4</td>
<td>932.2</td>
</tr>
</tbody>
</table>

\(^7\) The rainfall level is measured with a device named Pluviometer, which aggregates the daily rainfall for the whole month, in a specified location (the meteorological station).
**Case scenario**

First of all, the need is to have the data showing the daily rainfall levels.

Also, if the daily rainfall level is registered at the location of meteorological station, it renders a question that what is the water level in the downtown or in different barangays?

For this, there is a need to define a standard downtown location where it is possible to estimate the water level produced by a registered rainfall at the meteorological station.

It is likely that the water level at a defined standard location in the downtown or various barangays will be lower or higher than the reading at the meteorological station, depending on the drainage system.

Continuing the discussion as given above, it will be useful to look at the following table:

**Table 5: Estimating the variation in the Water level at Met station and the Water level in downtown**

<table>
<thead>
<tr>
<th>Water level at Met station (mm)</th>
<th>Water level in downtown (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Between</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>501</td>
<td>1,000</td>
</tr>
<tr>
<td>1,001</td>
<td>1,500</td>
</tr>
<tr>
<td>1,501</td>
<td>2,000</td>
</tr>
</tbody>
</table>

With the help of information in column 3 in the table above, a correlation between the records of meteorological station and the water level in downtown can be established. Such standard location in the downtown should have a neutral exposure to floods that is it should not be overly prone to flooding, which means that although floods can happen, but the location is not too close to the seashore or close to a river and so on.

After defining the standard location and correlating the rainfall level in downtown with the level of meteorological station, there is a need to define a standard household (building) in this standard location, which is exposed to flooding.

For example, consider a standard 5 meter tall building made up of concrete, with a façade of 10 meter length, exposed to flooding. The 404.8mm of water level at meteorological station produced a water level of 500mm (0.5m) at the building’s façade of this standard location, having poor drainage. It means that a surface of 10m x 0.5m = 5 sqm was damaged by water flooding. If the insurance was there, then this surface needs to be dried, repaired, repainted, etc. Assuming that the whole cost of repair is PHP 50 per sqm, including repair, paint, labour, etc. then the cost of repair of the total damaged surface would be PHP 50/sqm x 5 sqm = PHP 250.
Supposing that the building is insured for a sum insured (SI) of PHP 10,000 against the risk of flooding, not including the building contents insurance, then it means that the cost for the insurer will be PHP 250/PHP 10,000 = 2.5% of SI. This way, one should be able to fill in the column 4) in the following table:

<table>
<thead>
<tr>
<th>Water level at Met station (mm)</th>
<th>Water level in downtown (mm)</th>
<th>% Sum Insured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between 0 500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>501</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>1,001</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>1,501</td>
<td>2,000</td>
<td></td>
</tr>
</tbody>
</table>

In short, it is critically important to define a standard location as a reference point to measure the flooding in the downtown of municipality and to maintain the benchmarks of flooding as measured by meteorological station. This standard location, together with this standard building and Sum Insured (%SI) will allow the calculation of the risk premium for these standards, which is the pure risk premium. Subsequently, it is important to define the risk classes (depending on the classification used by the insurance company), using the factors such as the location, quality of building, etc. This will also help in obtaining the risk premiums for the risks’ classes, using loadings or discounts to the pure risk premium. This, however, cannot be done without having the data related to the vulnerability.

When it comes to data related to flood, there is a variety of approaches which may be adopted. For example, one can use the probabilistic models (such as OASIS⁸) or may choose to build the alternative stochastic flood models, which may be time-consuming.

In case of the risk of flash flood, it is likely that the cumulative rainfall will show the correlation with losses.

In case of the common risk of river flood, the local river flow rate or the level gauge data will help in finding correlation with the losses.

In case of the risk of a coastal flood or storm surge, the indicator of the tide gauge history will be used as a proxy to build the correlation with losses.

In terms of risk of flood events, most of the municipalities are somewhat affected since they are often located near the shoreline or a river.

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⁸ Oasis Loss Modelling Framework is an open source catastrophe modelling platform, which is largely driven by the global (re-)insurance community and aims to provide loss modelling tools and utility to everyone. For details, see https://oasislmf.org/
<table>
<thead>
<tr>
<th>Element</th>
<th>Data Needed</th>
<th>Description</th>
<th>Source / Method of Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazard</strong></td>
<td>Digital Elevation Model (DEM)</td>
<td>A DEM models the elevation of a terrain. For a proper flood model, a DEM with a high resolution (&lt;5m) is necessary to model the terrain and run a flood model.</td>
<td>Data providers such as Airbus, DigitalGlobe, etc.</td>
</tr>
<tr>
<td></td>
<td>River Depth</td>
<td>The depth of the river (bathymetry) is essential to calculate the discharge and storage capacity of a river.</td>
<td>Government agencies or local engineering Offices</td>
</tr>
<tr>
<td></td>
<td>Flow Rates</td>
<td>The water discharge from the source and by rivers to the main river carries a certain amount of water that carries over the year. It is important to know the volume to estimate the behaviour under certain assumptions.</td>
<td>Government agencies or local engineering Offices</td>
</tr>
<tr>
<td></td>
<td>Land Use Data</td>
<td>The land use around the river is important to model how much water will stay above the surface and how much can penetrate the ground. For instance, if the ground is sealed, then the water cannot be absorbed by the ground.</td>
<td>DENR, Namira</td>
</tr>
<tr>
<td></td>
<td>Soil Data</td>
<td>The type of soil is essential to estimate the amount of water that can be absorbed by the ground.</td>
<td>DENR, Namira</td>
</tr>
<tr>
<td></td>
<td>Vegetation Cover</td>
<td>Similar to the land use data, the type of vegetation is important to estimate the canopy storage and evapotranspiration.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rainfall / Weather Data</td>
<td>Accurate rainfall and weather data is highly important to model typical rainfall patterns of the past. Moreover, the frequency of events is crucial to estimate the losses under different scenarios over time.</td>
<td>PAGASA</td>
</tr>
<tr>
<td><strong>Exposure</strong></td>
<td>Building Infrastructure</td>
<td>Geographical location of buildings and their type (residential, commercial, public etc.), detailed data such as number of floors materials used, height and value</td>
<td>Damage calculation linked to construction, occupancy, protection, exposure</td>
</tr>
</tbody>
</table>
|                    | People                               | - Income levels  
- household size  
- location (link to building) |                                                   |

Table 7: The proposed data model for Flood risk
The severity level of Flood hazard is high (River flood 5 out 5, Flash flood 4 out 5) in the province of Agusan del Norte. This flood severity is high in case of floods with 100-year return period, and “Medium” in case of 500-year return period.
4.2 Ground shaking (Earthquake) Model

Ground shaking is described as the vibration of the ground during an earthquake. Most earthquake damage results from the shaking caused by seismic waves passing beneath buildings, roads, and other structures. This shaking of the surface of the Earth, resulting from a sudden release of energy in the Earth's lithosphere, creates seismic waves, which can range in size from those that are so weak that they cannot be felt to those violent enough to propel objects and people into the air, and wreak destruction across entire cities. The seismicity, or seismic activity, of an area is the frequency, type, and size of earthquakes experienced over a period of time. This can also trigger landslides and occasionally, volcanic activity.

Interestingly, the insurers in the Philippines have also emphasized on the need for mandatory earthquake insurance in the country, especially for household buildings and MSMEs. It is learnt that the Philippine Insurers and Reinsurers Association (PIRA) in the recent past also submitted its proposal on compulsory earthquake insurance to the government.9

| Table 8: The proposed data model for Ground-shaking risk |
|-----------------------------|------------------------|-----------------------------|

<table>
<thead>
<tr>
<th>Element</th>
<th>Data Needed</th>
<th>Description</th>
<th>Source/ Method of Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard</td>
<td>Land Use Data</td>
<td>The land use data to model how much intensity of ground shaking can cause effect on the buildings and infrastructure.</td>
<td>DENR, Namira</td>
</tr>
<tr>
<td></td>
<td>Soil Data</td>
<td>The type of soil is essential to assess the effects it can sustain after ground shaking</td>
<td>DENR, Namira</td>
</tr>
<tr>
<td>Exposure</td>
<td>Information about:</td>
<td>High quality seismic maps to map the hazard locations. Accurate location data is essential for assessing the impact and related perils. Given the high number of locations in a given LGU, it is recommended to prioritize data collection on the most critical and/or exposed assets.</td>
<td>LGU survey</td>
</tr>
<tr>
<td></td>
<td>- location</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- construction quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- financial values</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability</td>
<td>- Reconstruction costs</td>
<td>- Average financial values</td>
<td>LGU survey and consultation</td>
</tr>
<tr>
<td></td>
<td>- Livelihood needs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential Loss Estimation</td>
<td>- Historical Data (Frequency, Severity)</td>
<td>- Past frequency and future projection - Severity - Potential areas/locations of impact</td>
<td>Model projection to be overlapped/verified with past losses</td>
</tr>
</tbody>
</table>

9 See: https://insuranceasianews.com/philippine-insurers-favour-mandatory-earthquake-insurance/
The ground shaking happens as an effect of earthquake. The Agusan Del Norte faces a relatively high severity level of Earthquake hazard (4 on a scale of 5), having the probable maximum intensity (as per the MM scale\textsuperscript{10}) with an exceedance probability of 10\% in 50 years (equivalent to a "return period" of 475 years) for medium subsoil conditions. This is also shown in the image given below whereby orange denotes MMVII and red denotes MMVIII.

![Figure 10: Agusan Del Norte – Earthquake Hazard](image)

### 4.3 Drought Model

The Drought, which is a recurring feature of the climate in most parts of the world, is described as an event of prolonged shortages in the water supply, whether due to below-average precipitation, or due to the shortage of surface or ground water. A drought can be extensive and last for months or years, or may be just for a short time for as few as 15 days. It can have a substantial impact on the ecosystem and agriculture of the affected region and harm to the local economy.

Annual dry seasons in the tropics significantly increase the chances of a drought development, and the periods of heat can significantly worsen drought conditions by hastening evaporation of water vapour.

According to the CDRA data, the risk of droughts has been frequent in the municipality of Las Nieves and occurs almost every 1 to 3 years. This corresponds to a likelihood of occurrence of 6 (as per the table given below), which is also confirmed by looking at the information related to the frequency of the monthly rainfall in Las Nieves.

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\textsuperscript{10} The Mercalli intensity scale (or more precisely the Modified Mercalli intensity scale) is a scale to measure the intensity of earthquakes. It does not take into account energy of an earthquake directly, rather consists of increasing levels of intensity of shaking.
However, the susceptibility for droughts varies among different barangays. For example, in nine of the 20 barangays, the susceptibility to drought is seen to be low to medium–high (likelihood score of 4 to 5), while in the remaining 11 non–urban barangays, the susceptibility is considered as medium to high (likelihood score of 5 to 6).

It is reported that in Las Nieves, there are about 4,900 households who are dependent on agricultural farming for their income. The agricultural activities are mostly concentrated in the farming activities related to rice, corn, coconut, and coffee. While it is most likely that the farming animals and livestock are also affected to droughts, currently there is no information available about the numbers of animals and their farms in Las Nieves.

There is a need to specify the details of all crops and their acreage for every barangay, in relation to the total agricultural area in the individual barangays. This will also help in validating the information on the financial damage caused by drought in the individual barangays.

Overall, the impact of drought on the community is viewed as moderate to high. The vulnerability is viewed as medium–high to high due to drought. It can therefore be assumed that drought events have a significant impact on the living conditions of the people in Las Nieves.

Data on agricultural damage is available for the drought which happened in 2016, according to which, a total of 14 barangays in Las Nieves were affected by the drought, and the total damage was over PHP 4 million.

In Agusan Del Norte, corn planting is one of the major sources of livelihood, particularly in the Las Nieves. Corn planting is mostly for food–related purposes and feeds, as the farmers plant both white and yellow corn, respectively. The corn production areas are located mostly along the Agusan River, taking advantage of the fertile alluvial soil, however, it is reported that there is a risk of contamination with heavy metals, considering that mercury and other heavy metals had been reported to be present in Agusan River\textsuperscript{11}.

4.4 DATA GATHERING

4.4.1 Exposure data

In order to understand and provide suitable CRI solutions for the LGU, a comprehensive exposure database of all private assets within the jurisdiction of the LGU needs to be developed. This cannot be done without the support from the LGU, which will help in describing all households, MSMEs, and their building infrastructure, within the municipality’s boundaries. This database will then be used as an input to the risk models for the selected risks, such as the droughts and the earthquake, to quantify the level of risk faced by the population in the LGU.

To keep it simple, at this stage we recommend to exclude the public infrastructure such as roads, hospitals, schools, municipal buildings, etc. and focus only on the households and MSMEs within the jurisdiction of the LGU.

4.4.2 Multi Hazard Data Gathering

A detailed and granular exposure dataset has to be compiled, which can be used for multiple hazards such as Flood, and Earthquake. Since the hazard of Drought is unique in nature as it directly affects the agriculture productivity, and not other physical assets, a separate exposure dataset needs to be compiled. For example, in case of Las Nieves:

- **Built-up area**: The estimated size of the built-up area in the municipality is about 245 hectares, most of which face the flood risk. According to this, an area of 87.5 hectares is threatened by flooding, whereby the susceptibility to flooding is estimated to be large for an area of 80.5 hectares and moderate for an area of about 7 hectares. There is no known information about areas with low susceptibility to flooding.

- **Potential damage due to flooding**: The potential damage from flooding of the arable areas, which have a medium to high susceptibility, is up to PHP 212 million.

- **The dataset**: It should account for all crops grown in Las Nieves. It is understood that the major crops grown in the jurisdiction of Las Nieves include Rice (approximately 1852 hectares, with a production share of 55.5%), Corn (approximately 795 hectares, with a production share of almost 24%), and Coconut (approximately 559.8 hectares, with a production share of almost 17%). In addition to these, other prominent crops include coffee, bananas and other fruits.

- **Potential damage due to droughts**: At this stage, it is unclear that what is the vulnerability of the cultivation areas of Las Nieves to the risk of droughts. It is likely that not all crops grow in the areas which have high vulnerability to the risk of flooding or which have access to suitable irrigation, hence their risk to drought is higher than other areas.

Available at:
https://www.researchgate.net/publication/313477274_Agricultural_development_and_habitat_change_in_the_Agusan_River_Basin_in_Mindanao_Philippines
It is estimated that the average yield per hectare for the three major crops is around PHP 90,000, with a potential damage of about PHP 141 million. If there is no damage from drought in areas affected by flooding at all, the estimated value of losses will be PHP 75.5 million. Assuming the three major crops are destroyed in entirety in this area, the potential maximum loss will be approximately PHP 288 million, as of the current values.

- **Production forest**: A significant part of the municipal area is overgrown with production forest (21,561 out of 32,604 hectares). Severe damage to the forest from recurring droughts cannot be ruled out. Furthermore, increasing drought events could lead to a higher number of bush fires.

### 4.4.3 Vulnerability data

Once the exposure is available, it will then be matched against the hazard data to arrive at the vulnerability. Different parts of the LGU will be facing variable degree of exposure. This means that the households and MSMEs within different parts of LGU will be facing variable degree of vulnerability.
Chapter 5. THE INSURANCE and NON-INSURANCE POSSIBILITIES

5.1 Insurance solutions

In case of the high severity, low frequency climate risks, it is a plausible idea to consider getting insurance. The risks which are less frequent and where it is economically viable to insure them can be passed on by the LGU to insurers and reinsurers. However, more severe climate disaster risks are best protected through insurance because such risks can be difficult to be absorbed by any LGU and can cause losses far in excess of an LGU’s financial capacity.

Since the LGU has preference to protect its population and businesses from more frequent hazards, such as floods, drought, and ground shaking, the nature of insurance cover and the level of protection may depend upon the contingent needs of the population and the businesses in the LGU. For example, within the LGU, there may be a higher concentration of vulnerable MSMEs, than more vulnerable household population. Also, these risks may not remain same forever and show a non-monotonic behaviour over medium to long term.

As a starting point, following types of insurance covers may be considered:

![Figure 12: Potential CRI coverage options](image)

However, given the current data and time constraints, it might not be plausible to start offering all CRI-related insurance products right away. As a starting point, it is

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12 The non-monotonic behaviour occurs when over the years, a climate risk becomes inevitable to happen. However, after happening of the risk, there is a gradual decline in the probability of that risk to happen again in the foreseeable future. It can also be defined as an “inverse U shape”.

Mitigating Climate Risks through Insurance and Non-Insurance Solutions, a case of Las Nieves 37
recommended to consider starting with the most needed insurance covers. This may possibly include the: (i) Property Insurance; and the (ii) Loss of Income and Livelihood insurance, both for the households as well as for MSMEs.

5.2 Choice of Insurance Products

A variety of traditional insurance products may be available, ranging from the pure indemnity-based insurance\(^{13}\) to the pure parametric insurance\(^{14}\) products. The table given below provides a quick snapshot comparison of the two types:

\(^{13}\) The indemnity-based insurance coverage is based on an agreed value, which informs repair or replacement costs in the event of damage.

\(^{14}\) In parametric insurance, the payment tracks the performance of an objective index and pays out on the occurrence of a pre-agreed threshold. The index is usually a proxy measure for loss, having a strong correlation with the payout amounts.
### Table 9: Comparative of Insurance Products

<table>
<thead>
<tr>
<th>Insurance type and Description</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Complexity</strong></td>
<td><strong>High data requirements</strong></td>
</tr>
<tr>
<td>Pure parametric</td>
<td></td>
</tr>
<tr>
<td>- Simple and easy to implement, with predictable outcomes</td>
<td></td>
</tr>
<tr>
<td>- Neutral/ independent loss definition and verification by an independent agency</td>
<td></td>
</tr>
<tr>
<td>- Very high chances of basis risk</td>
<td>[✓]</td>
</tr>
<tr>
<td>Indexed parametric</td>
<td></td>
</tr>
<tr>
<td>- Less simpler than pure parametric but better than modelled-loss approach</td>
<td></td>
</tr>
<tr>
<td>- Varied levels of hazard models based on different trigger points</td>
<td></td>
</tr>
<tr>
<td>- Loss calculation based on hazard model extrapolated with trigger levels</td>
<td>[✓]</td>
</tr>
<tr>
<td>Modelled-loss</td>
<td></td>
</tr>
<tr>
<td>- CAT model helps in payout estimation</td>
<td></td>
</tr>
<tr>
<td>- Expensive exercise to build a model</td>
<td></td>
</tr>
<tr>
<td>- Helpful only if all risk exposures are similar</td>
<td></td>
</tr>
<tr>
<td>- Low basis risk</td>
<td>[✓]</td>
</tr>
<tr>
<td>Indemnity</td>
<td></td>
</tr>
<tr>
<td>- Payment of actual loss on the basis of loss verification</td>
<td></td>
</tr>
<tr>
<td>- Costly loss adjustment process</td>
<td></td>
</tr>
<tr>
<td>- No basis risk</td>
<td>[✓]</td>
</tr>
</tbody>
</table>

### 5.3 Macro and micro-level options

#### 5.3.1 Macro level

At the macro-level, the LGU can be the policyholder for insuring against the defined risks. They can have multiple options of protection i.e. protecting the public assets and infrastructure, and protecting the households and MSMEs in their jurisdictions.

- **Protecting the public assets and infrastructure:** Although as discussed above, insuring the public assets is beyond the focus of this report, this type of insurance protection will be intended for protecting the public assets such as roads, hospitals, schools, etc.

- **Protecting households and MSMEs:** Insurance protection may be provided for all households and MSMEs located within the jurisdiction of the LGU. This may include:
  
  - Direct cash assistance for loss of income and sustainability of livelihood; and
  - Indirect cash assistance to help in reconstruction of houses and damaged property
Financial assistance may also be provided to MSMEs and households for loss of income, which will in turn help in economic recovery. For example, in Australia, the federal government provides a Disaster Recovery Allowance which is meant to make up for the lost income and to support the recovery.

Past figures may help in estimating the details of ex post reconstruction and retrofitting costs of recovery from a climate disaster event. Knowing such costs will help in estimating the premiums to be charged and their calibration against true actuarial cost of the insurance coverage.

To calculate the potential fiscal costs of climate events which cannot be insured, there is a need to estimate the probability and impact of an event with financial impacts exceeding the capacity of the insurance products to absorb. There are countries, like Belgium, which provide a stop loss arrangement on losses to private sector-run insurance scheme, whereby such limits of stop loss arrangement is calculated as the government’s potential payments as a function of the probability of an event expected to trigger the guarantee.

5.3.2 Micro level

Garnering the benefits of macro level (LGU-level) insurance policy and combining it with the micro-level options, especially for the delivery of insurance benefits at the grassroots level, it is proposed that all MSMEs and low-income households within the jurisdiction of the LGU to have access to insurance to insure their property and income.

This way, the main insurance policy will be held at the macro level, just like the example of PPIP (see the case example given below), where the main policy is held by the Philippines Bureau of the Treasury, but the households and MSMEs within the jurisdiction of LGU will be enlisted as the beneficiaries at the micro-level.

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**Case example**

**The Provincial Parametric Insurance Program (PPIP)**

In July 2017, the Philippines launched a catastrophe risk insurance program to protect national and provincial government agencies against the financial losses from severe natural disasters.

The Program covers the risks of Typhoon, and Earthquake, whereby the main insurer is the government-owned insurance agency, the Government Service Insurance System (GSIS). Although the policyholder in this case is the Philippines Bureau of the Treasury, the beneficiaries are 50% for national government agencies and 50% for provincial governments of the 25 selected provinces. The program provides an insurance cover of PHP 10.4 billion, such that the payout amounts are pre-defined and trigger based on physical event parameters.

Under this program, the GSIS provides catastrophe risk insurance to the national government and the participating provinces. The World Bank acts as an intermediary to transfer GSIS’s risk to a panel of international reinsurers, which were selected through a competitive bidding process.
The premium will be paid by the policyholders, and the payment of compensation will also directly flow to the households.

It is understood that the government of Philippines aims to increase the access to microinsurance coverage to 50 million people by 2022\textsuperscript{15}. This is planned to be done by providing access to affordable insurance products to people and farmers living in natural disaster-prone areas. Currently, it is reported that there are almost 38.9 million people having access to microinsurance, which has increased by more than ten times from three million policyholders since 2009. This increase is mostly attributed to higher sales volumes in insurance products provided by the mutual benefit associations (MBAs), in addition to the life and non-life insurers providing affordable, short-term insurance policies.

One of the possible channels of outreach by the LGU to reach the low-income toeholds and MSMEs could be through the vast network of MFIs and cooperatives.

\emph{Case example}

In the aftermath of typhoon Yolanda, the microinsurance policyholders claimed approximately PHP 500 million as compensation in a very short time, mostly through the accessible non-banking institutions, like pawnshops and remittance centres. This signifies that microinsurance has proven to provide a mechanism of social safety net for vulnerable segments of the population in the wake of climate disasters.

Creating a micro-level CRI solution, combined with the policy control issued at the macro-level, is recommended.

5.4 Indemnity vs. parametric products

It is important to understand the contrasting differences between the indemnity and parametric-based insurance, before making an informed decision about the choice. Following are some of the main differential characteristics of the two:

\footnote{\url{https://business.inquirer.net/271086/govt-eyes-microinsurance-coverage-for-50m-filipinos}}
### Table 10: Differences between Indemnity and Parametric Insurance

<table>
<thead>
<tr>
<th></th>
<th>Indemnity</th>
<th>Parametric</th>
</tr>
</thead>
</table>
| **Payment trigger** | Payment is generally triggered by actual loss of or damage to a physical asset.  
For example, physical damage and business interruption loss due to flood, etc. | Payment is triggered by the occurrence of a specific event, exceeding the pre-decided parametric threshold.  
For example, an earthquake of minimum magnitude of 7.0 within a defined area, etc. |
| **Recovery**        | Compensation is generally calibrated to the actual loss sustained.  
For example, for e.g. assessment of actual loss sustained due to flood, etc. | The payment structure is pre-decided, based on the event-related parameter or index value.  
For example, variable payout amounts with variable earthquake magnitudes. |
| **Basis risk**      | The degree of variation in compensation and actual loss depends upon policy conditions, deductibles, and exclusions, which may leave the policyholder with some amount of risk retained. | There is usually a correlation between the index, the loss, and the compensation payout, although the compensation may not be exactly the same amount as the loss. |
| **Claims process**  | Usually the claims process is complex and based on the outcome of loss assessment, depending on the complexity of the loss. | Once the event has occurred as per the established index, generally the claims process is simple and predictable, based on an index parameter, and without any need for loss adjustment.  
For example, the index based on third-party data, like the national meteorological department. |
| **Term**            | Usually annual, although multi-year coverage is possible but uncommon. | Single or multi-year. |
| **Structure**       | Standard products, with standard industry wording, although limited customization can take place. | Highly customized, unique, and flexible coverage, with tailored index and payout structure. |

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16 The Basis risk is the risk that the trigger index does not perfectly correlate with the underlying risk exposure resulting in the client suffering a loss but the parametric insurance not being triggered. It is unlikely to eliminate the basis risk in index-based insurance, it can be fairly minimized by carefully designing insurance products, such as using the double trigger events, staggered payouts, etc. For example, in the case of a flood, having a partial payout for lower level floods and progressively increasing payouts for more severe floods.
There are certain relevant examples of indemnity-based insurance schemes. For example, the Thailand’s Rice Disaster Relief Top-up Insurance Programme, which started in 2011 when the government’s relief was not sufficient to compensate the farmers for their actual losses. The multi-peril crop insurance scheme provides insurance protection against major climate risks and pest/disease attacks, in a public-private partnership, and insures the entire rice farming community for an area of more than 10 million hectares. The farmland is divided into five zones based on their risk exposure and the premiums are actuarially charged. The claims payout is indemnity-based. The insurance scheme works by providing a supplementary payment (in addition to the financial assistance provided by the government through the disaster relief programme) to those farmers who have bought the insurance cover and whose farm is located within a declared “disaster area”. Different premium rates apply per zone and the government supports farmers by subsidising the premiums.

Subsequently in 2019, Thailand announced USD 682 million in subsidies to help stabilize prices for rice farmers hurt by drought and a strong baht. Under the new rice scheme, the government agreed to pay farmers a fixed price for a set amount of production if market prices fall below benchmark prices during the main harvest seasons. There have been different categories of insurance under this scheme:

- Jasmine rice insured at USD 500 per ton up to a maximum of 14 tonnes per household;
- Jasmine rice, grown outside of irrigated area, insured at USD 450 for up to 16 tonnes per household;
- Prathum Thani jasmine rice insured at USD 350 for up to 25 tonnes per household;
- Glutinous rice insured at USD 390 a ton up to 16 tonnes per household; and
- Non-glutinous rice insured at USD 325 up to 30 tonnes per household.

The government has estimated that the scheme will cover about four million farmers, and in future it plans to introduce additional measures, such as cash handouts to cover the cost of harvesting.

### 5.5 Recommended solution: Parametric

After weighing the pros and cons of the parametric versus indemnity-based insurance products, and since the overall objective is to provide a mechanism for rapid access to post-disaster funds, which can help in early recovery in a cost-efficient/time-efficient manner, it is recommended that a parametric insurance vehicle is developed.

It is also recommended since it is relatively more feasible to develop an insurance solution based on the most common climate risks indicators, such as the rainfall level, wind speed, etc. Having the parametric insurance will mean that:
- the insurance policies will make the claims payout within the shortest possible time after the occurrence of an event;
- this will not only deliver speed but will also be a cheaper option than traditional indemnity-based insurance as the precise data requirements will be considerably lower and claims settlement will be minimally invasive;
- the use of a verifiable proxy measures will largely eliminate the risk of moral hazard, as the insurance payouts will be driven by the meteorological or seismic data, also resulting in cost-effective technical insurance pricing.

Due to its simplified operational and service design, the parametric insurance is recommended, combined with the hybrid model of the macro and the micro-level insurance covers. This way the insurance policy will be issued and managed by the LGU at the macro-level whereas the benefits of the cover will be available at the micro-level, through grass root-level distribution channels such as the MFI, cooperatives, etc. Also, there will be no need to have a number of loss adjusters and claims handlers to process damages incurred after a cyclone or a drought.

The parametric insurance payouts will be determined based on the physical features of the natural hazard event, such as water levels, the wind speed, ground shaking for earthquakes, etc., rather than on the basis of actual losses suffered by the individual households and MSMEs.

There has to be a choice of index parameters which are most closely correlated to actual losses at the particular locations. To decide the insurance payouts, the data verification of the parameters will be done on the basis of data from independent agencies, thus helping in transparent and swift payouts after a disaster occurs.

The parametric indices will be developed for insurance cover against floods, droughts, and groundshaking. The parametric indices will be calculated individually for the jurisdiction of the LGU. Such index parameters will be measured at a central location in each barangay and then adjusted to the risks located in that barangay.

5.6 Structure of the Recommended solution

Ideally, this parametric cover should be offered through an LGU-level risk pooling arrangement, whereby all climate-related risks will be consolidated for all barangays at the level of the LGU. This LGU-level insurance arrangement is recommended to be carried out in conjunction with the existing Disaster Risk Reduction and Management (DRRM) Fund of the LGU, which will be a common structure to collectively buy insurance for protecting the households and MSMEs in the LGU’s jurisdictions.

Through streamlining the insurance solution with the existing DRRM Fund of the LGU, the LGU will be able to consolidate the climate risks faced by households and MSMEs in its jurisdiction. The risk accumulation will not work as an insurance company; rather it will only serve as a risk consolidation mechanism, affording scale and collective bargaining power to the LGU to procure cost-effective insurance for the risks faced by households and MSMEs in its jurisdiction.
This pooling arrangement will also help in layering of the risks, by creating at least two layers, one for the insurable risks, and another layer for the risks which cannot be insured or are financially unviable to be insured.

Following figure show the pathway of choice, traversing that how the combination of different insurance options and functions are proposed to be built together.

The legal aspects of such pooling arrangement will be discussed in the subsequent sections.

5.7 Limitations and potential challenges

While the parametric insurance may be a useful to protect against the impacts from extreme rain or wind events, it is a common observation that the parametric insurance is less suitable for covering the risks due to flood. This is because the independent flood-event proxies are subject to excessive basis risk.

Since the objective of having a climate risk insurance product is to adequately protect those who are exposed to risk, and ensure efficient payouts, in case of floods, a hybrid solution can be considered which provides the technical and operational efficiency of parametric insurance, coupled with the certainty of indemnity-based loss assessment.

Although one has to be careful that in case of a micro-level solution, a disadvantage of providing direct compensation could be spending of insurance claims fund proceeds by the policyholders on non-intended purposes.

5.8 Data requirements of a parametric solution

The data and operational requirements of developing a parametric solution depend upon the hazard against which the insurance protection is needed. For example, the rainfall is a good measure of crop performance in drought. The scarcity or limited availability of data will lead to a simpler parametric insurance solution. Following are the specific data requirements for various hazards if their respective parametric insurance solution is to be sustained.

In case of developing a parametric solution, the data will be required in multiple dimensions, such as:
Figure 15: Data requirements of a parametric solution

5.8.1 Flood

In case of the flood hazard, the solution is not easy to be structured on a parametric basis as the relationship between verifiable flood ‘intensity’ and actual damage is complex. In order to make it workable, the flood risk has to be well determined through the data of local rainfall (if it is a flash flood).

This way it may be possible to cover this risk on a modelled-loss parametric basis, instead of the pure parametric basis. This also means that only for the flood hazard, there will be a need to arrive at a catastrophe model, and linking it to the parametric solution to retain the benefits of a simpler product, efficient servicing, and faster payouts. This hybrid approach of modelled-loss plus the parametric will utilize an index of a set percentage of modelled property loss, corresponding to the level of flood at a reference point location. Examples are the insurance schemes such as the CCRIF, PCRIC, etc.

For example, let’s have a look at the rainfall data in an LGU. The data is assumed to be registered at the Meteorological Station, for the period from 1972 to 2018.
Table 11: Annual rainfall data (in mm)

<table>
<thead>
<tr>
<th>Statistics/Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum (mm)</td>
<td>1,524.2</td>
<td>1,244.0</td>
<td>1,516.7</td>
<td>622.2</td>
<td>855.9</td>
<td>520.5</td>
<td>474.2</td>
<td>471.6</td>
<td>501.7</td>
<td>607.9</td>
<td>1,243.5</td>
<td>1,473.1</td>
</tr>
<tr>
<td>Minimum (mm)</td>
<td>84.0</td>
<td>23.1</td>
<td>33.7</td>
<td>10.6</td>
<td>16.2</td>
<td>62.8</td>
<td>46.9</td>
<td>9.8</td>
<td>36.2</td>
<td>132.7</td>
<td>74.2</td>
<td>80.9</td>
</tr>
<tr>
<td>Average (mm)</td>
<td>506.5</td>
<td>305.2</td>
<td>270.0</td>
<td>146.9</td>
<td>148.9</td>
<td>210.5</td>
<td>216.1</td>
<td>158.4</td>
<td>209.2</td>
<td>318.7</td>
<td>495.7</td>
<td>641.5</td>
</tr>
<tr>
<td>Standard Deviation (mm)</td>
<td>310.2</td>
<td>271.3</td>
<td>258.8</td>
<td>128.7</td>
<td>138.4</td>
<td>107.2</td>
<td>91.8</td>
<td>113.6</td>
<td>129.3</td>
<td>205.8</td>
<td>311.3</td>
<td></td>
</tr>
</tbody>
</table>

Figure 16: Exceedance frequencies for yearly maxima of rainfall in the LGU

Figure 17: Trend line of frequencies for yearly maxima of rainfall in the LGU

Here the exceedance frequencies are important to be understood and carry out the premium calculation. Since the high rainfalls are comparatively infrequent, the insurer’s risk
assessment can be based on the frequency with which these high values will be exceeded. This frequency of exceedance is the risk that the insurer is willing to accept.

Also, it is important to understand the Return period, which is defined as the inverse of the exceedance frequency.

![Return Period - Truncated Gumbel](image)

**Figure 18: Return period rainfall events in the LGU**

**Case example**

With truncated Gumbel extreme value distribution, the return period for an event like “maximum exceeding 1,500 mm” has a return period of 40 years. It means that such an event is happening “once in 40 years”. It does not mean that one has to wait 40 years for such an event to happen, it can happen any year in the next period of 40 years, with an annual frequency of $1/40 = 0.025$ or 2.5%.

The risk premium for floods takes into consideration the damage produced by different extreme events. The damage is calculated as a percentage of the sum insured and the frequency is defined as return periods.

For instance, for “Location A” an extreme event as “1 in 10,000 years” (i.e. with annual frequency of $0.0001$) produces a damage of 70% of the sum insured for content of buildings and 24% of the sum insured for buildings. Correspondingly, the risk premium for contents is 1.8% of the sum insured and 0.8% of the sum insured for buildings. For an insurance policy with $1,000$ sum insured for contents and $10,000$ for building, the corresponding risk premium is $18$ and $80$, respectively.

Looking at the example graphs given above for the LGU, the maximum return period, for the time being, is 40 years, and the annual probability 0.025, much higher than 0.0001 in case of “Location A”, although this return period is registered at the meteorological station. It is expected that the impact of a maximum exceeding 1,500 mm at meteorological station will be different in downtown, i.e. “one in 100 years event”, with an annual probability 0.01, but
still higher than the “Location A”. It means that the risk premium for household insurance in the LGU (building and content) is higher than the above values.

5.8.2 Earthquake (Ground shaking)

There are certain commercial licensed sources available for securing data when it comes to earthquake risk modelling in Philippines. These include the AIR, RMS, among other providers. It is important to keep in view that regardless of the municipality’s geographical boundaries, the earthquake models usually leverage local as well as regional data to represent the understanding of seismic hazard and building vulnerability models. The detailed maps are required which can show the varying soil types near the exposures, and the intensity of ground shaking at a site which can hugely differ even within regions.

The data model also needs to take into account the location-specific construction practices and building codes, damage surveys, and engineering research to be able to more accurately reflect the variability of the building stock.

Also, the earthquake data models take into account additional damage functions, such as tsunami, liquefaction, fire (following the earthquake), ground shaking, and landslide, which are often the by-product of earthquakes.

Here the need will be that the model captures the frequency and magnitude of “tail” scenarios, which are the infrequent events causing large losses, in addition to the low-loss periods, both of which contribute towards estimating the average annual losses.

It is recommended that the earthquake risk is covered using a modelled-loss product, which although will be designed at individual barangay-level but consolidated to cover all neighbouring LGUs, utilising a national-level catastrophe model for earthquake risk. This will make it possible to have a national model which is adapted at the barangay-level, helping in calculating the payouts based upon the existing maps. The parametric index for an LGU will be based on the average ground-shaking as the post-event estimate by the United States Geological Survey’s ShakeMap for every barangay. In order to arrive at a more balanced representation of the final index, the index value will be assigned weights of respective barangay’s population, to show the weighted average effect of the earthquake on each barangay.

5.8.3 Drought

There are various known methods monitoring the drought, for instance, the Drought Severity Index (DSI) method. A research carried out in Pakistan for the Drought Monitoring and Performance Evaluation of MODIS-based DSI method confirmed the effectiveness of the DSI method to observe the drought severity, its duration and spread, and to ensure effective planning for mitigating its possible adverse effects. The study utilized both satellite and in-situ data for consistent and accurate drought monitoring across the country.17

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5.9 Selected Products

5.9.1 Property insurance

The LGU is recommended to start with getting the insurance for the houses and building properties of the low-income households in its jurisdiction. Although, the financial value of such assets is largely unknown, one of the proxy measures to estimate their value could be to find out the minimum and maximum value of such assets, which will provide a potential range of sum insured, and then the LGU can decide upon an average value as the sum insured to protect the properties of such low-income households.

A difference should be made between content insurance and building insurance.

Product details

Following are the tentatively proposed product details of the potential Property insurance product:

<table>
<thead>
<tr>
<th>Purpose</th>
<th>To protect the household “Property” from financial shocks due to climate risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covered participants</td>
<td>All heads of households, regardless of annual income, hence there will be no eligibility criteria. However, their source of income needs to be known to ascertain if there is a need of including the Drought cover.</td>
</tr>
</tbody>
</table>
| Risks covered | - Floods  
- Ground shaking  
- Drought (only for agriculture risks, including livestock) |
| Product type | Trigger-based index insurance (based on observed values) at a centralized level, and as declared by the LGU |
| Product description | The insurance policy will pay out when threshold values for risks (such as the wind, rainfall, etc. are exceeded), without any claims assessment procedure |
| Details about benefits | The fast cash payouts will enable the affected households to rebuild their homes, etc. after a climate-risk event. |
| Data monitoring and reporting | Assistance to the low-income households through risk reduction measures, alerts/notifications about approaching risks in advance, alert policy holders to approaching weather events, allowing them to take precautionary measures and reduce exposure; training and education module to help communities better understand the insurance tool and improve insurance literacy |
| Data monitoring and reporting | Data to be monitored by LGU with the help from external agencies, like DOST. Details for specific hazard monitoring unit to be decided jointly with the relevant authority. |
5.9.2 Livelihood and income protection insurance

The vulnerable parts of the LGU, especially the areas inhabited by the low-income households, are prone to climate risks, making it a challenge for people to cope with the damaging effects of weather-related risks and the threats such risks pose to their lives and livelihoods. The expected increase in the frequency and intensity of extreme weather events brought on by climate change will further exacerbate the plight of vulnerable households in such localities, many of whom are employed in climate vulnerable sectors such as agriculture.

Continual exposure to weather-related risk reduces economic opportunity, exhausts financial resources and erodes the overall coping capacity of low-income individuals, leading to lost livelihoods and poverty in the long-term. Protecting the livelihoods of low-income, vulnerable individuals by improving their ability to cope with weather-related risks can make a positive contribution to socio-economic development in the longer run.

 Appropriately designed CRI solutions can help people respond better to climate-related risks. The Livelihood and Income Protection (LIP) insurance is proposed specifically to help vulnerable, low-income individuals recover from the damage caused by climate risks.

Targeted at low-income households, this product will help in protecting the livelihoods of vulnerable low-income individuals by providing swift cash payouts following extreme climate risk events. This crucial support will assist in reducing poverty and vulnerability by enabling these groups to recover quickly following a disaster. It will also help in stabilizing the financial situation of vulnerable, low-income individuals after a disaster and allows them to avoid adopting coping strategies that could lead them deeper into poverty. In addition, the advance warning system will help in mitigating the future losses by informing households about the approaching events so they can employ risk reduction strategies.

In order to provide this insurance, one has to first identify the target households. This will itself be a challenging task since there are not many reliable data sources on income or expenditure for such households. It is recommended that the LGU should be able to identify the exact number of households below the poverty line across its entire jurisdiction. One of the possible ways could be by looking at the statistics compiled by the Philippines Statistics Authority\(^\text{18}\), which may possibly give an idea about the average household income in a municipality at the barangay-level.

An alternate way could be to use a “Proxy Means Test” (PMT) approach. The PMT is a method to predict income and poverty status of households using data on basic household characteristics. The LGU can select a representative sample of households and based on the sample information, an estimated figure can be forecasted regarding the potential loss of income of poor households due to a climate risk.

Product details

Following are the tentative product details of the proposed Livelihood and Income Protection (LIP) insurance product:

### Purpose

To protect the low-income households from financial shocks due to climate risks

### Covered participants

All low-income households. Ideally the head of the household will be covered/registered, regardless of annual income; hence there will be no eligibility criteria. In case there are more than one family living in a household, there has to be an identification mechanism to identify the head of every family, like a family tree, etc. Also, the source of income needs to be known (whether the household is engaged agriculture-related activities) to ascertain the need of including the Drought cover.

### Risks covered

- Floods
- Ground shaking
- Drought (*only for agriculture risks, including livestock*)

### Product type

Trigger-based index insurance (based on observed values) at a centralized level, and as declared by the LGU

### Product description

The insurance policy will pay out when threshold values for risks (such as the wind, rainfall, etc. are exceeded), without any claims assessment procedure

### Benefit details

- Fast cash payouts will enable the affected households to regain their livelihoods, in the shortest possible time after a climate-risk event.
- Assistance to the households through advance alerts about approaching risks, allowing them to take precautionary measures and reduce exposure.
- Education and awareness module to help communities better understand the insurance tool and improve insurance literacy

### Data monitoring and reporting

Data to be monitored by LGU with the help from external agencies, like DOST. Details for specific hazard monitoring unit to be decided jointly with the relevant authority.

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### 5.10 Risk-layering Approach

The risk-transfer through insurance can help in providing the financial resilience at the level of LGUs as well as at the level of individual households, by providing a supply of funds in a post-disaster environment. When climate disasters strike, insurance can provide financial protection to reduce setbacks to economic and social development. However, insurance is
one of the available climate-risk financing mechanisms, along with other potential possible options as discussed above.

It is recommended that a hybrid approach by combining the LGU’s “Weather data” and the “Asset valuation information” is used. This will not only help in reducing costs by protecting the LGU, but by also reducing the moral hazard as the insurance payouts will be index-linked and compensation will be payable only if the index is triggered.

- **Scope of insurance cover**: The insurance products are recommended to be designed to cover different layers of risks: the “Large size risks (High risk layer)”, which will be meant to provide protection against extreme weather events, which are less frequent but extremely severe. The “Medium size risks (Low risk layer)” will be meant to provide protection against climate risk disaster events that are quite frequent in their occurrence but mostly less severe in nature.

![Figure 19: The layering of risks using Insurance](image)

- **The sum insured**: This will be variable depending on the average size of household and average income, individually in each barangay. There will be a maximum cap on the sum insured, and subject to the loss severity, the insurance claim will be payable. Given the average value of the household property within the jurisdiction of the LGU, the sum insured values can be worked out, both in the optimistic as well as pessimistic scenarios.

- **The premium**: The price of insurance will be worked out based on the risk vulnerability of each barangay’s location.

- **Deductible/ Excess**: Given the nature of the insurance product, it is recommended that no deductible on the insurance policy is applied.

- **Distribution channel**: It is recommended that the LGU will be responsible to procure insurance for households and MSMEs in its jurisdictions. Such households and MSMEs should be able to transact and access the insurance benefits through the commonly accessible channels such as MFIs, cooperatives, etc. For the risks where insurance is not required or is not viable, the LGU will be using its other strategies such as risk retention or reduction, as discussed later in this section.
- **Controlling Anti-selection and Moral Hazard:** It should be compulsory for all households and MSMEs to participate in the insurance program. Also, to curb the moral hazard, the insurance product should be index-linked so that, if a disaster is triggered on the index and as announced by the LGU based on credible data sources; only then the households and MSMEs should receive the insurance payout.

### 5.11 THE NON-INSURANCE OPTIONS: Transferring the Residual Risk

Usually, in the absence of proper insurance coverage or where the insurance is unviable, there is a chance that people as well as the LGU will get unreasonably burdened in the events of unforeseen economic losses. This situation is exacerbated when the risks are simply uninsurable due to their frequency or severity or prohibitive insurance premiums.

In such scenarios, it is important to look at options as an alternative of insurance. There may be a variety of possible solutions and options to address such scenarios, some of them have been discussed in this section.

Despite the fact that various municipalities may face unique and different risks from one another, the LGUs can manage the economic losses due to climate risks at a broader level. This means that there should be a risk protection mechanism at LGU-level.

One of the possible options is the utilization of the existing mechanism of the DRRM Fund available at the LGU-level.
Case Scenario

The Local Disaster Risk Reduction and Management Fund

It is understood that there is the Local Disaster Risk Reduction and Management Fund (LDRRMF), which is the principal source of funding for all types of disaster-related spending under the LGU’s control. The LDRRMFs were established by the Philippine Disaster Risk Reduction and Management Act of 2010, under which each city is mandated to allocate no less than 5% of the estimated revenue from regular sources to be allocated in the following manner:

- **Quick Response Fund (QRF):** This is 30% of the annual LDRRMF allocated to the QRF for post-disaster financial liquidity. Resources from the QRF are available upon the declaration of a state of calamity at a local (city or higher) or national level by the relevant body.

- **Mitigation Fund:** This is 70% of the annual LDRRMF and should be allocated to the mitigation fund for use in disaster prevention, mitigation, preparedness, response, rehabilitation, and recovery projects identified in a city’s local disaster risk reduction and management plan and integrated in its annual investment program.

- **Special Trust Fund (STF):** These are the unspent balances of the LDRRMF at the end of a budget year accruing to a special trust fund for use within 5 years for the sole purpose of disaster risk reduction and management activities of the Local Disaster Risk Reduction and Management Council (LDRRMC). Any amount not utilized within 5 years reverts to the city’s general fund for social services purposes.

The LDRRMF is governed by the LDRRMC and administered by the Local Disaster Risk Reduction and Management Office. The LDRRMC guides the city’s disaster risk management actions and is responsible for reviewing and planning for expenditure at the local level as well as for declaring local states of calamity.

Since the structural design of the Fund already exists, it is just the matter of adding details to its functionality related to insurance.

Refocusing the purposes of the Fund and linking it to the provision of insurance will help in ensuring that adequate financial resources are available to protect the households and MSMEs within the jurisdiction of the LGU with the help of insurance, in case a climate disaster strikes.

In this manner, the compensation through insurance protection will remain available quickly to the LGU to continue its services in the communities which are or may become more vulnerable in a post-climate disaster situation.

It is important that in order to avoid the risk of anti-selection and moral hazard while utilizing the resources of the Fund for insurance purposes by making it mandatory across the municipality and for all barangays. This will support the Fund through regular risk-weighted contribution, allocated from each part of the municipality/barangays, whereby LGU will be consolidating the contribution to the Fund which will commensurate with the climate disaster risks faced by municipality.
Other options include the LDRRMC, which manages the local fund, followed by the QRF special trust fund which is an unexpended LDRRMF allocation. Then it’s the Municipal Development Fund (MDF) which is a local fund for long-term development projects.

It is understood that there is also an indemnity-based insurance available through the GSIS\(^1\) as well as parametric insurance available through the PPIP, which has already been discussed earlier in this report.

### 5.11.1 Capitalization of the Fund

The Fund can be capitalized using funds from public and donor sources. According to the DRRM law, it is mandates that 5% of the LGU’s Internal Revenue Allotment (IRA) shall be allocated to the DRRM Fund. This source of funding, in addition to other sources could include a mix of fixed budgetary allocations by the governments, the international donor organizations, and the local and international institutions.

Globally, most sovereign catastrophe insurance pools have been set up with support by the international donors\(^2\) for start-up costs, capitalization, and even premium financing, since the start-up costs are high and maintaining the financial stability, especially in the initial years, is a challenge for such Funds.

The size of the Fund depends on the planned sale of its operations. The main factors that determine the size of the Fund’s capital include operational costs for the initial 3 to 5 years, premium contribution/subsidy amount, reinsurance cost, and a minimum of two to three years’ reserves.

### 5.11.2 Contribution in Fund

For calculation of the contribution in the Fund, there could be following two approaches, among other options:

- One where the barangays located in the riskier geographical locations should be subject to higher premium contribution than the barangays located in the less risky locations for the same extent of potential losses. This will ensure that safer barangays do not end up cross-subsidizing the riskier barangays; or

- The second approach could be where each barangay is allocated with a standard contribution which is worked out as an average for all barangays within the jurisdiction of respective municipalities.

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\(^1\) The Government Service Insurance System (GSIS) is a government-owned and controlled insurance provider. Cities are required by law to insure their assets against “fire, earthquake, storm, or other casualty” with GSIS. Premiums for GSIS insurance are funded by each city’s general services department (from their annual investment plan) and payouts are received on an indemnity basis to match the monetary value of damage to the insured assets.

\(^2\) The World Bank Group assisted the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and the World Food Programme assisted the African Risk Capacity (ARC).
5.11.3 Utilization of the Fund

The Fund can be useful in various contexts for protecting against natural disasters of varied severities. For example:

- **Low severity, high frequency risks**: The risks due to frequent, small and predictable natural disaster events, which are uninsurable, will be best managed by the Fund itself;

![Figure 20: The layering of risks using "Non-Insurance options"](image)

A risk layering approach under which the frequent but smaller risks can be retained, so that a considerable insurance premium is saved while larger and catastrophic risks can be fully insured so that the Fund can be protected against any major catastrophe. Adopting the risk layering approach would help the Fund in building its own reserves so that in times when the insurance and reinsurance markets become harder, it can afford to self-insure certain risks; and, also over the years, its over-reliance on insurance and reinsurance can be controlled.

The financial management of climate risk public exposures requires careful assessment of the relative costs and benefits of different approaches. For example, investments in risk reduction or risk transfer can reduce the future cost of recovery and reconstruction although both involve potentially significant, upfront costs. Similarly, investment in measures to improve insurability or coverage of risks by the insurance arrangements could reduce future costs related to financial assistance and compensation. It is important to keep in view as to whether the reduction in future costs is worth the upfront investment.

In general, the financial risks related to high-frequency/low-cost climate risk events are most efficiently managed through risk mitigation and/or retention within the Fund, as
transferring such risks to insurance companies would be costly. However, extreme climate risk events are generally more conducive to risk transfer. The risk transfer, of course, comes with a cost as the insurance companies need to be compensated for uncertainty, administration, and the maintenance of sufficient capital.

The assessment of various approaches also needs to consider the incentives, or pros and cons created by these options and the impact of those incentives on ultimate costs. For example, the broad availability of ex post compensation may reduce the incentives for MSMEs and households and the LGU to invest in risk reduction or risk transfer and may ultimately increase the eventual costs of financial assistance and compensation provided.

By combining all layers together, we get the following structure of the proposed Fund:

![Diagram showing the layering of risks using all Insurance and Non-Insurance options](image)

**Table 12: The layering of risks using all Insurance and Non-Insurance options**

### 5.12 Distribution Channels

According to the Philippine’s Insurance Commission, the most common microinsurance distribution channels are the rural banks as well as the MFI's and cooperatives. For example, the Cebuana Lhuillier is considered as a proactive player in the microinsurance space, with an ability to leverage its 2,500 branches to offer products.
These common and prominent distribution channels usually have a high capacity to engage with and raise awareness among the low-income households and MSMEs, since they already operate in the communities and enjoy trust among their customers. They have a high brand reputation, thus affording them the trust of customers that the insurance claims will be processed quickly and assistance will be provided when needed.

One of the examples could be the Pioneer Life Insurance, which works closely with all major types of distribution channels, including the Pawnshops, NGOs, Cooperatives, MFIs, and the Rural Banks. For Pioneer, the pawnshops serve as the largest distribution channel followed by Rural Ranks, NGO’s and lastly Cooperatives.
It is reported that between 2013 and 2016, the Pioneer Insurance settled approximately PHP 400 million in claims for disaster risk insurance, out of which 98% was towards the coverage for typhoon risks. Pioneer launched the crop insurance product in 2016 to protect local farmers, who have been vulnerable to intense weather events. The product focused on rice and corn crops. It was reported that the lack of policies around product design and limited awareness about the product in vulnerable communities were seen to be among the factors inhibiting the growth of climate risk insurance since then.

Another partnership in Philippines between AXA Insurance and the CLIS with DTI aimed to provide comprehensive disaster risk insurance, geared towards MSMEs. The product provides property insurance for natural disaster such as fire, lightening, typhoons and floods.

This shows that reasonable experience is available in Philippines in the MFI and cooperatives segments in delivering the climate risk insurance products to the vulnerable communities.
Chapter 6. NAT CAT MODELS

The Nat Cat modelling, also known as the cat modelling, is the process of using technology-assisted calculations to estimate the losses that could be sustained due to a catastrophic event, such as a flood, tropical cyclone, or an earthquake. The cat modelling helps the insurance industry in analysing the risks, in conjunction with other fields such as the actuarial science, engineering, meteorology, and seismology.

At a macro and broader level, the catastrophe modelling can be done for the jurisdiction of the LGU with the modelled calculations to estimate the losses that could be sustained due to a catastrophic climate risk event.

6.1 Input and Output Data

The data to be input into the Nat Cat model will be the information on the exposures, within the jurisdiction of the LGU including households and MSMEs, which are vulnerable to catastrophe risk. The exposure data can be categorized into three basic groups:

The output of the Nat Cat model will be the estimate of the projected losses that the model will predict, which could potentially happen upon the occurrence of a particular event. The output will be in the form of a probabilistic loss distribution. The “Probable Maximum Loss” (PML) and the “Average Annual Losses” (AAL) will be calculated from such loss distribution.

The Nat Cat model will help in deciding upon the risk transfer needs, through insurance and reinsurance.
- Historical loss data: with certain attributes linked to exposure data with the same attributes, vulnerability assumptions can then be developed.

It is critically important to start creating a comprehensive database of the above mentioned data dimensions, which will help in modelling the risks. It will be valuable to improve the capturing of data that are essential for the cat model, such as details of asset location, asset type, and financial value/reconstruction values, etc.

6.2 The Nat Cat Model details

6.2.1 Exposure Module

Having the Exposure data will help in classifying the attributes of assets linked to event loss response. It is important to have the information about the geographical location of the assets, including the households and the MSMEs, along with the information about the severity and levels of potential damage which can be caused by a variety of hazards.

Once the information about the severity and levels of damage are known, then extrapolating it with the financial valuation information will help in arriving at the true estimates of the exposure values. This will include information about the projected loss to buildings, contents, people, business interruption, etc.

6.2.2 Analytical Modules

This will include the information about the location, size and frequency of loss events. It will be necessary to have the Hazard-related data, which will help in creating a probabilistic event forecasting. It is important to have the information about the potential event’s intensity at a particular location, which may cause any loss. Also, having the information about the financial and economic values will help in determining the sum insured and premium.

6.3 Working of the Nat Cat model

When a climate disaster will occur, the Nat Cat model will calculate an estimated loss amount. If this loss amount exceeds a pre-determined level - or trigger point - it will lead to a payout. The program can have multiple trigger points: for example, one for medium events and one for severe events (defined with a 10% and 3.3% probability of occurrence) where the LGU can get insurance payouts.
Chapter 7. ROLE OF LGU IN INSURANCE and RISK MANAGEMENT

7.1 General recommendations

Some of the general recommendations for the LGU, which are not necessarily directly linked to insurance, include:

**Risk reduction measures:** There does not seem to have enough ex ante resources to invest in risk reduction measures and support the pre-disaster building of infrastructure which could minimize the impact of climate-induced risks. It is recommended that a portion of funds should go into the pre-insurance risk reduction measures. This may include improving the water drainage canals, reinforcement of riverbanks, ensuring the adherence to the building codes, etc.

**Availability of sites for relocation:** It is reported that majority of the barangays do not have available alternative sites for the relocation of affected families or individuals to susceptible hazards. It is recommended that suitable sites should be identified where the post-disaster relocations, even if temporary for the period of reconstruction, can take place.

**Limited government resources:** Anecdotal evidences show that the government resources are limited due to insufficiency of funds. In addition, commercial establishments may not be covered by government resources. The LGU has limited resources to support risk mitigation measures to local infrastructure or facilities. It is recommended that the government should work to mobilize resources, part of which can go toward risk reduction measures, while part can be used for insurance coverage. A detailed risk layering plan, along with the design of the insurance layers, as discussed in the previous chapter, needs to be developed.

**Quality of construction:** It is understood that at the moment, most of the residential structures and construction does not comply with the zoning standards, and may take a long time to do so. It is recommended that construction codes need to be followed in order to qualify for insurance. This will not only help in risk reduction which but will also help in reducing the price of insurance.

**Early warning system:** There is an imminent need to have an integrated early warning system which can forecast the effects of the approaching climate disaster. The early-warning system needs to be developed and implemented jointly with the meteorological department and LGUs.
7.2 Ensuring the insurance supply and pricing

Based on lessons learned from around the world, the insurance pools or funds remain largely ineffective if participation is not made compulsory or encouraged for a large set of population. This will ensure a large pool of premium which is available to make the insurance component of the DRRM Fund as a viable option.

All of the premium contribution should accumulated in the Fund under a predetermined criteria and the Fund should then procure insurance on competitive terms for the entire risk portfolio of the LGU, from the domestic and international insurance and reinsurance markets.

The Fund should also be able to set a pricing tariff, based on objective actuarial principles, for the risk pricing of various hazards, as identified in the previous sections. These risk-based rates will create a healthy mix of hazards of a diverse nature, ultimately balancing-out the loss ratios. The mandatory covers will help in generating large numbers, which will be essential for the sustainability of the Fund.

Also, due to the mandatory participation for all households and MSMEs across the jurisdiction of LGU, the risks will spread out, with less anti-selection and the insurance loss ratios will be less severe, thus improving the profitability of the Fund’s program.

7.3 Protecting the financial viability

A continuous revenue and funding stream will be required by the Fund to build its reserves which are sufficient enough to continue providing the DRM and insurance. A five to ten-year roadmap may be developed in consensus with key stakeholders by setting up short-, medium- and long-term goals to gradually manage the financial liability.

A strategy should be formulated for sharing subsidy costs by the LGU and the provincial governments. It is also recommended that in a situation of severe losses, a contingent guarantee be put in place by the provincial government to fund the deficit. For example, in the New Zealand, the Earthquake Commission (EQC) has a Crown guarantee in place provided under section 16 of the Crown Entities Act, 2004 that any liabilities of the EQC in case of a negative equity shall be met by the government.

7.4 Possible challenges and long-term solutions

Some of the possible challenges and their long-term solutions, which the LGUs may like to pursue, include:

**Data collection for insurance purposes:** When it comes to looking at the data collection activities carried out by the LGU, it is likely that the data collection exercise carried out under the CDRA activity was done without the main objective of insurance or risk transfer solutions development, and that is why it shows certain inherent limitations. It is recommended that in future, data collection on climate risks is carried out while including
more detailed data which could be useful for seeking insurance solutions, such as the loss
details, loss frequency, loss location, etc.

**Hazard-specific/ Exposure-specific data:** It is important for an insurance company to have
specific information about the frequency and severity of past disasters. For example, in case
of a flood event, the data should be able to identify the location-wise details of damage
caused by it. In case of agriculture-related risks, certain additional pieces of data points
should also be added into any future CDRA exercise.

**Coordination amongst government and public agencies:** There should be a stronger and
systematic/ hierarchical coordination among various government and public agencies. A
stronger coordination will result in the LGU having enhanced capacity to respond to
disasters without any delay in receiving provincial support. This will also help in the ability
to track the provincial or federal budgetary allocations to the LGU. Also, this will help in
consolidating a central repository of data to form a systematic picture of the relief efforts by
all agencies. Also, the knowledge about CRI solutions developed and implemented by LGU
should be shared among other LGUs for learning and improvement.

**Plans for budgetary and resource allocation:** A standardized mechanism should be
developed which the LGU can follow for allocating resources and budgets for insurance and
non-insurance solutions, however, such plans should be flexible enough to suit an individual
LGU’s needs, as the climate risks and disaster outcomes vary from time to time. An
objective and technical basis will be useful for LGU to determine resource allocations for
disaster response in their budgets, such as the population statistics, agriculture or MSME
productivity, tax revenue/ turnover, etc. An objective planning of budgets will also help the
LGU in developing an overall understanding of the financing needs and gaps to meet
preparedness plans.

**Donor coordination:** The area of climate disaster management is still evolving, hence the
LGU should have a set of institutional protocols for mobilizing and utilizing the donor
support, otherwise the support from donors will be difficult to streamlined and may result in
the duplication of efforts leading to gaps in other areas.

**Gaps in the available data:** The inaccessibility of data on the underlying hazards and their
past and possible future financial implications is one barrier to the informed ex ante
provisioning of funds. A comprehensive technical capacity building needs to be carried out
to help the LGU in developing the necessary tools to regularly gather and record useful data,
and to make the informed decisions for reducing risks and use the possible risk transfer
mechanisms.

**Challenges in distribution channels:** To overcome the issues of transparency and pilferages,
effective distribution channels need to be identified and developed further for the purpose
of the distribution of insurance relief and rehabilitation services. For example, MFIs,
cooperatives, or mobile channels with biometric verification can immensely contribute to
reducing operational costs of any new product to be launched in the area of climate risk
insurance.
Moral hazard risk management: Experience shows that the moral hazard remains a major challenge in most of the public insurance programmes. People tend to get excessively exposed to more risk because they know that they will be getting the insurance compensation if they suffer the loss. Also, it is possible that the low-income population becomes so much dependent on the freely available insurance subsidy that even with their transition to higher-income-level groups, they would choose not to take out private insurance at all, in the expectation that the government or the Fund will subsidize the premiums. In view of the above, subsidy levels may gradually need to be reduced by simultaneously reducing the risk exposure of vulnerable groups by investing in smart subsidies, research and development of climate-resistant construction practices, and also making MSMEs pay a token contribution towards the payment of the premium amount. Additionally, deductibles and conditional payments are mechanisms which will also serve to limit moral hazard problems.

Political and fiscal risk: Political instability and fiscal shocks may pose serious threats to the sustainability of the accumulated resources. Safeguards should be put in place to ensure the continuation of the functioning of the DRRM Fund after transition/succession in the political government setup. Also, it should be ensured that the DRRM Fund is insulated from political interference and its existence should continue despite any successions and transitions in the political setup.
Chapter 8. CHALLENGES AND WAY FORWARD IN INSURANCE ADAPTATION MECHANISM

8.1 Legal and Fiscal Framework

There has been a contrasting disparity between the need for climate risk insurance and the availability of enabling legal and regulatory frameworks, in most of the markets, if not all. To facilitate the innovative climate risk insurance products, the insurance regulatory framework has to be less restrictive and allow non-traditional interpretations of the law, not being limited to the traditional indemnity-based insurance products.

The parametric insurance products have to be allowed by the regulators as the valid insurance contracts. If the current regulatory framework explicitly restricts the provision of parametric insurance products and while the change of law is being considered, a hybrid solution can be considered whereby there is an additional trigger of loss declaration.

Similarly, the retention capacity of the domestic insurance industry should also be gradually increased so that in the years to come, it should change its role from a mere fronting arrangement to an effective risk-taker, thereby reducing the contingent liability of the government.

Also, legal aspects must be cleared out from the beginning so that the Fund's accumulated reserves and the investment returns generated on such reserves are exempted from taxes under the tax law applicable to its net income and profit on investments. The net income and investment profits will allow the Fund to gradually become self-sustainable and less reliant on the external funding.

8.2 The Challenges

Other than the major challenge of data availability, there are several issues which needs to be addressed before CRI solutions can be developed and promoted within the LGU. These include:

- **Risk reduction measures**: Adequate measures need to be taken to implement risk reduction activities, which will not only bring down the insurance premiums and make it as less expensive but will also protect the vulnerable communities from unforeseeable climate disasters.

- **Insurance education and awareness**: Promoting the insurance culture and its benefits among the target communities is vital. People need to see insurance as an essential service for their survival in an environment which is vulnerable to frequent climate risks.
- **Affordability of insurance premium**: The insurance premiums need to be low and as affordable as possible because people need to see value in it, especially if the premiums are not going to be subsidized in the longer run.

- **Issues in mapping the Flood Risks**: Estimates of frequency and assessments of impact of floods on the building structures are critical for land-use planning, as well as investing in risk reduction measures. This eventually also impact the pricing of insurance premiums. The non-availability of high-quality maps that provide an up-to-date assessment of the level of flood risk by geographical area becomes a significant impediment to effective financial management of flood risk, including insurance.

The flood hazard maps, whether prepared by the public authorities or by the commercial vendors, are expected to provide information on flood probability based on the extent of potential flooding, water levels and/or flow velocity under different flood scenarios.

One of the most significant challenge is that due to diverse levels of flood risk across the LGU, it is difficult to maintain the consistent, high-quality and updated flood risk maps. Some of the measures which can help in overcoming this challenge could be that the flood maps should:

- provide sufficient information on the location and cost of potential damage or the frequency of flooding;
- use standard flood return periods for different locations;
- reasonably capture the changes in urbanisation, building stock, or climate change impacts, and where possible, include flash flooding; and
- Also, the flood maps should not underestimate the base flood elevations and consequently, the flood risk to building structures.

### 8.3 Financial and risk literacy

There is no doubt about the need to increase the levels of risk and financial literacy among the households and MSMEs in the jurisdiction of the LGU. A baseline survey conducted by the International Labour Organization (ILO) in 2010\(^\text{21}\) in Philippines shows that the climate risks have a huge impact on the incomes of farmers. The survey highlighted the need for innovative ways to avoid further damage on crops and incomes of farmers, and also informed that the largest percentage of survey respondents (49%) indicated their preference to choose insurance provider which provide easy access to claims payment.

Interestingly, 51% of the overall survey respondents showed interest in getting insurance, and for the people who did not show willingness to get insurance, 53% of them mentioned the reason of their unwillingness to be due to insufficient income.

27% of the survey respondents showed interest in specifically getting the crop insurance. 70% of the respondents showed interest to have insurance if the premium was not more than PHP 100, while 21% indicated their interest to have insurance if the premium is up to PHP 200. The study did not clearly mentioned if these premium amounts are for monthly or annual premium, but the majority of the respondents (46%) showed their preference to pay monthly insurance premium.

8.4 Implementation of DRRM Activities

The LGU should plan and implement the programs and activities for DRRM, which will also help in garnering more funds and resources for such activities. Such programs may include the activities related to disaster preparedness, disaster response, disaster rehabilitation, and recovery, including activities such as:

- Construction of multi-purpose evacuation and relocation centres;
- Procurement of equipment and heavy machinery, such as the trucks, fork lifts, backhoe, grader, etc.;
- Installation of rain gauges at various scattered and central locations;
- Installation of water gauging stations at the river points;
- Installation of physical alarm/ alert systems;
- Provision of subsidies for the equipment agriculture farmers;
- Training and skills deployment for the DRRM activates;
Chapter 9. CONCLUSION and RECOMMENDATIONS

This document has served as a primer to discuss the issues, challenges, solutions, and opportunities to overcome the risks of climate disasters faced by the LGU. The Las Nieves shows its general vulnerability to climate risks, with some degree of variation in its expected vulnerability to specific risks.

The discussion about the major risks faced by LGU, namely the Floods, Drought, and Ground shaking, helped in prioritizing the needs to protect households and MSMEs from these hazards.

The two proposed insurance products, namely the property insurance and the livelihood/income protection insurance, will work in tandem to protect both the MSMEs as well as the vulnerable households. The analysis of various possible options, from indemnity based insurance to parametric insurance, revealed their pros and cons in the situation at hand, and this helped in recommending the parametric-based insurance solution for the LGU, which should be executed at a macro level (LGU-level).

Various factors and data collection points have been recommended to procure data related to the hazard, exposure, and vulnerability faced by the households and MSMEs within the LGU, which will help in calibrating the proposed insurance products and their pricing. However, at this stage, the rough sketch of the proposed insurance products will provide a baseline to the LGU to deliberate on their needs and suitability of the insurance cover. Upon consensus of the LGU, the products can then be negotiated and refined in consultation with the insurance partners.

There has also been a discussion about the non-insurance solutions, which will be necessary for such parts of the risks which cannot be insured or are unviable to be insured. For this, it is recommended to use the DRRM Fund at the level of the LGU for insurance purposes, which will also work as a layered-reservoir for risks which cannot be transferred to the insurance companies.

In addition to these, discussion has also been carried out on some of the possible challenges and their long-term solutions. While some of these are related to insurance, others are not directly linked to insurance, but may have an influence on the sustainability and choice of risk transfer solution chosen by the LGU. These include:

- **Investing in the risk reduction measures**: This will help in supporting the pre-disaster infrastructure which could minimize the impact of climate-induced risks. Adequate measures need to be taken to implement risk reduction activities, which will not only bring down the insurance premiums and make it as less expensive but will also protect the vulnerable communities from unforeseeable climate disasters.

- **Availability of sites for relocation**: This requires that suitable sites be identified where the post-disaster relocations can take place.
- **Improving the quality of construction:** This means that the construction codes should be followed in order to qualify for insurance. This will not only help in risk reduction which but will also help in reducing the price of insurance.

- **Implementation of an early warning system:** This will help in forecast the effects of the approaching climate disaster, hence helping in preparing against the possible impact of disasters and other undesirable events.

- **Collecting data for insurance purposes:** This means that in future, the data collection on climate risks should be carried out while including more detailed data which could be useful for seeking insurance solutions, such as the loss details, loss frequency, loss location, etc.

- **High quality relevant data collection model:** The data should provide the detailed information about the frequency and severity of past disasters, such as the location-wise details of damage caused by it. It is recommended that a comprehensive technical capacity building needs to be carried out to help the LGU in developing the necessary tools to regularly gather and record useful data, and to make the informed decisions for reducing risks and use the possible risk transfer mechanisms.

- **Regulatory facilitation:** The CRI should benefit from an enabling legal and regulatory framework, which will facilitate the innovative climate risk insurance products. The less-restrictive regulatory framework will allow non-traditional interpretations of the law, not being limited to the traditional indemnity-based insurance products.

- **Insurance education and awareness:** It is important to promote the insurance culture and its benefits among the target communities is vital. People need to see insurance as an essential service for their survival in an environment which is vulnerable to frequent climate risks.

This document has mapped out a variety of challenges and solutions. Furthermore, a detailed discussion on the potential insurance and non-insurance solutions, coupled with an action-led approach in implementing the recommendations will lead to the implementation of the proposed climate risk protection mechanism. The proposed insurance products are only seen to be a starting point, and remain open to customization to the specific needs of the LGU. The sustainability of effective climate risk solutions depends upon the dedication and commitment of the partners to protect the vulnerable households and MSMEs from the adverse climate effects.
References and recommended readings


CGIAR, 2015, ‘Scaling up index insurance for smallholder farmers: Recent evidence and insights’, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).


HLURB, 2015, ‘Supplemental Guidelines on Mainstreaming Climate Change and Disaster Risks in the Comprehensive Land Use Plan’, Housing and Land Use Regulatory Board.


