



Assessment of Adaptation to the Impacts of Typhoon Pablo (Bopha) in Eastern Mindanao, Philippines

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Abstract

The paper identified adaptation gaps in the post-Typhoon Pablo (Bopha) recovery and reconstruction based on two assessment approaches: (1) roundtable discussion participated in by representatives of people's organizations, international and national non-government organizations, civil society organizations, and national and local governments; and (2) survey and conjoint analysis of communities' preferences on adaptation assistance and risk reduction measures in three villages of New Bataan, Compostela Valley Province. The first assessment recommended a set of actions for adaptation and risk reduction, while the second provided the adaptation preferences of the affected communities. The results revealed that, on the one hand, some adaptation preferences of the communities do not support the action points from the roundtable discussion. On the other hand, some action points do not reflect the adaptation concerns of the communities. These results suggest the critical need to increase the representation of disaster-affected communities in future discussions and to build the disaster risk reduction (DRR) awareness of all vulnerable communities in the region. With regard to risk governance, results from both the roundtable discussion and survey are consistent. Both assessments recommend participatory governance in the implementation of recovery and reconstruction programs, with the governments providing overall guidance to the stakeholders.

Keywords: adaptation · conjoint analysis · disaster risk reduction · Eastern Mindanao · risk governance · Typhoon Pablo (Bopha)

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Introduction

Typhoon Pablo (Bopha), which entered the Philippine Area of Responsibility (PAR) at 6 PM on 2 December 2012, rapidly intensified into a Category 5 Super Typhoon on 3 December 2012 (Philippine Atmospheric, Geophysical and Astronomical Services Administration [PAGASA], 2012). During its landfall over Baganga, Davao Oriental, in the wee hours of the morning of 4 December 2012, it reached an average speed of 185 kilometers per hour (kph) and gusts reaching 210 kph (Lagmay et al., 2013). Typhoon Pablo was the most powerful storm to have hit the island of Mindanao, southern Philippines, in more than 100 years of recorded storms. It affected over 6.2 million people, destroying livelihood and shelter, food sources and natural resources in the eastern seaboard of Mindanao—this included the provinces of Davao Oriental and Compostela Valley in Region XI and the provinces of Surigao del Sur and Agusan del Sur in Region XII (Office for the Coordination of Human Affairs [OCHA], 2013). Some 1,146 people were recorded dead, and 834 people were reported missing (Lutheran World Relief [LWR], 2013). The human disaster that is Typhoon Pablo accounted for 19.7% of the global disaster mortality in 2012 (Guha-Sapir, Hoyois & Below, 2013). Reducing the risk of future disasters is imperative for the Philippines, which is considered as one of the top five countries that are highly vulnerable and susceptible to natural disasters (Guha-Sapir et al., 2013).

Disasters provide an opportunity for communities and governments to “build back better” following an extreme event. As a framework and approach in post-disaster recovery and reconstruction, ‘building back better’ improves the community’s physical, social, environmental, and economic conditions to create more resilient and adaptive communities (Birkmann, 2013; Mannakkara & Wilkinson, 2014; United Nations Office for Disaster Risk Reduction [UNISDR], 2015; Twigg, 2007).

For instance, the government’s recovery programs are critical steps towards increasing the adaptive capacity of vulnerable communities. The post-Typhoon Pablo government recovery and reconstruction programs were: (1) the “Moving up after Pablo (MAP) New Bataan Comprehensive Rehabilitation and Recovery Program (MAP New Bataan CRRP)” of the municipal government of New Bataan, (2) the “Reconstruction and Development Framework 2013-2016” of the regional government of Davao Oriental (Davao Oriental RDF 2013-2016), and (3) “Post-Pablo Livelihood Cluster Action Plan for Davao Oriental and Compostela Valley Province” of the Department of Agriculture (DA) (Post-Pablo LCAP). To reduce vulnerability, however, these programs should be able to address the adaptation needs of the communities. Mismatches between the policy implementation and societal goals that are largely influenced by preferences resulted in adaptation gaps (Olhoff, 2014).

This paper aims to assess the relevance of the government’s adaptation measures to the affected communities in Eastern Mindanao. The two levels of assessment conducted for this study consisted of (1) a roundtable discussion participated in by representatives from national government agencies (NGAs),

local government units (LGUs), non-government organisations (NGOs), and civil society organisations (CSOs); as well as (2) a household survey of residents in the municipality of New Bataan, which sustained the most damage from the typhoon. Based on these assessments, the paper identified the challenges to recovery and reconstruction programs and the gaps in adaptation measures, which need to be addressed to enhance people’s resiliency and adaptive capacity to deal with similar disasters in Eastern Mindanao in the future.

Methods

Case Study Area

The case study area is the region of Eastern Mindanao, which consists of eight provinces located in the southeastern part of the Philippines (Figure 1). This region has been known to be socially vulnerable, even before the onslaught of Typhoon Pablo. For example, food insecurity in Eastern Mindanao is between medium and high levels (Food and Agriculture Organization [FAO] & World Food Programme [WFP], 2013). The provinces of Davao Oriental and Compostela Valley

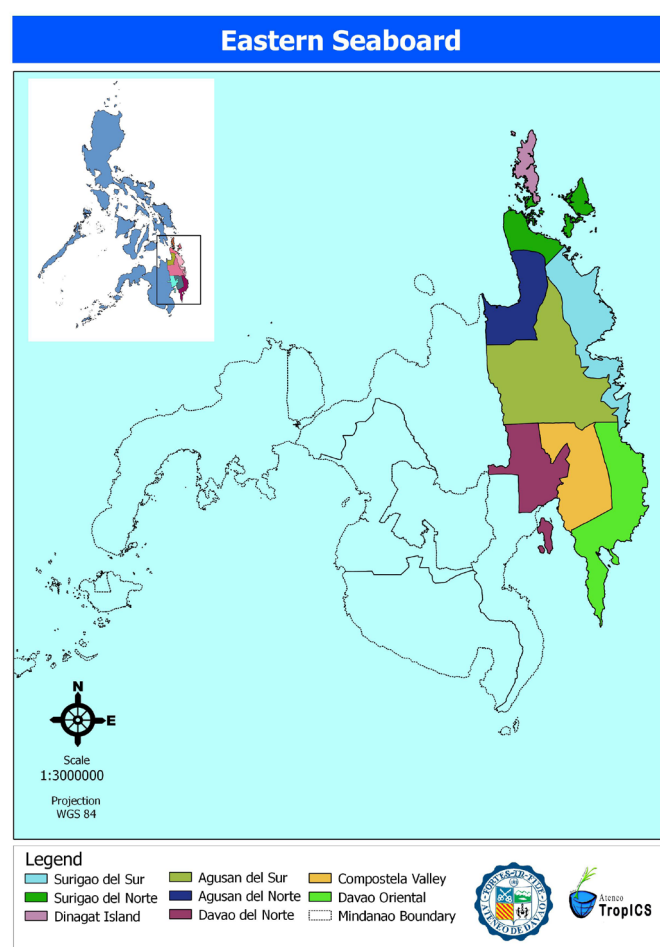


Figure 1. Map of the Eastern Seaboard of Mindanao (Manuta, 2013)

have acute and chronic malnutrition rates that are above the national average (Department of Science and Technology [DOST], 2011). Davao Oriental and Agusan del Sur are two of the poorest provinces in the Philippines (National Statistics Coordination Board [NSCB], 2009). Further, Conservation International Philippines reported that Eastern Mindanao, dubbed as the “timber and mining corridor of the Philippines,” is environmentally vulnerable (Conservation International Philippines [CIP], 2013). Most of the area’s remaining rainforests are currently under logging concessions, leading to the loss of forest cover, soil erosion, and river sedimentation. Forestlands have also been converted into agricultural land, one of the sources of livelihood for large parts of the provinces. Agriculture is an important economic sector in most of these provinces.

Typhoon Pablo caused approximately PhP 31 billion (USD 0.756 billion) worth of damage on agriculture and infrastructure (Table 1), in addition to the loss of human lives and damage to property. This made the Philippines one of the top countries in the world that incurred the highest economic losses in 2012 (Guha-Sapir et al., 2013). In January 2013, the Post-Typhoon Pablo Inter-Agency Emergency Food Security, Nutrition and Livelihoods Assessment for Typhoon Pablo provided details on the estimated damage to major crops in the region (Table 1). Damage to livestock and poultry, fisheries infrastructure, and irrigation facilities were estimated at PhP 327,000 (USD 8,000), PhP 53 million (USD 1.3 million), and PhP 829 million (USD 21 million), respectively (OCHA, 2013). The extent of damage on agriculture and property was observed during the ocular visit of the authors (Figure 2).

Table 1. Extent of the impact of Typhoon Pablo on Eastern Mindanao

Human Impacts*	Estimated Loss and Damage	
Total number of deaths	1,067	
Total number of affected people	6.2 million	
Total number of missing people	800	
Number of houses damaged	216 thousand	
Infrastructure destroyed	3.4 billion PhP	
Private property destroyed	18.3 million PhP	
Damaged Crops**	PhP	USD
Banana	20 billion	500 million
Coconut farms	7.22 billion	193 million
Rice	197 million	5 million
Corn	362 million	9 million
Farms growing high-value crops***	2 million	50 thousand
Abaca plantations	233 thousand	6 thousand

Sources: *NDRRMC (2012); **OCHA (2013).

***These include coffee, cacao, vegetables, rubber, and fruit trees.

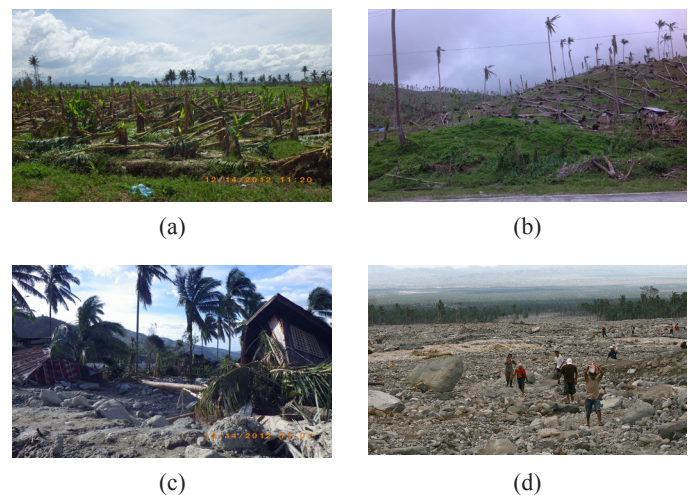


Figure 2. Destroyed (a) banana and (b) coconut plantations; (c) damaged property in Compostela Valley; and (d) rubble of houses and other structures swept away by wind and water in the village of Andap (Manuta, 2013; Bacongco, 2012)

Photos (a), (b), (c) by Mr. Glenn D. Depra; (d) by Ms. Ruby Thursday More

Among the eight provinces, Compostela Valley (Comval) did not only experience the most economic damage, it also had the greatest human mortality. Almost half of the total deaths in Mindanao were recorded in Comval’s New Bataan municipality. Huge volumes of water reportedly came down from the mountain slopes, causing heavy mud floods and landslides. Thick mud, logs, and large rocks blocked the roads, making it difficult for rescuers to reach the municipality after the disaster (Acosta et al., 2016). Figure 3 shows the extent of the debris flow resulting from floods and landslides in New Bataan.

Among the New Bataan villages, Andap was the most affected—houses and public facilities were destroyed as mud flowed and rocks rushed down (Figure 2, Figure 3). Post-Pablo studies in Andap (Lagmay et al., 2013; Acosta et al., 2016) revealed the physical and social processes conditioning the vulnerability of the people and their livelihood: Andap is located at the mouth of a mountain drainage network, at the base of steeply-sided slopes, and on the exact path of the debris flow (Figure 3). Andap sustained at least 70 deaths, 290 missing persons, and 1,250 damaged houses after the typhoon (Acosta et al., 2016). The other two most affected villages were Cabinuangan, the urban center, and Cogonon, the poorest village in New Bataan.

Analytical Tools and Data

The enormous impact of Typhoon Pablo on the environment, economy, infrastructure, and livelihood prompted the Philippine government to develop recovery and reconstruction programs to enhance the resilience and adaptive capacity of the local communities to respond to similar disasters in the future. This paper assessed the three most relevant government programs (Annex 1 for details):

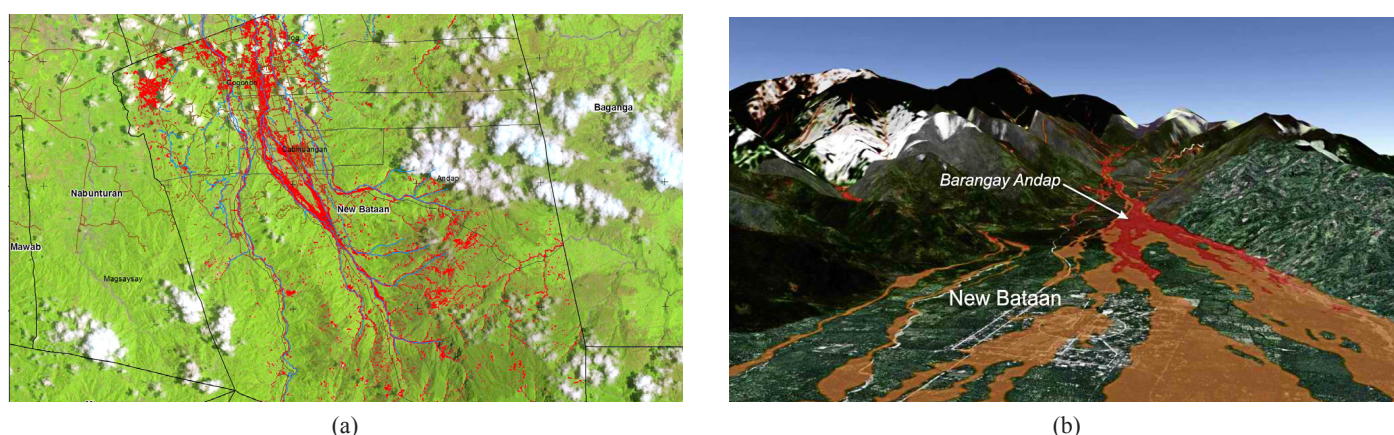


Figure 3. Satellite image (a) and 3D image (b) of the debris flow from floods and landslides in New Bataan, Compostela Valley (Acosta et al., 2016; Lagmay et al., 2013)

1. Municipal government: “MAP New Bataan Comprehensive Rehabilitation and Recovery Program (MAP New Bataan CRRP)”
2. Regional government: “Reconstruction and Development Framework 2013-2016” in Davao Oriental (Davao Oriental RDF 2013-2016)
3. National government: DA’s “Agriculture’s Post-Pablo Livelihood Cluster Action Plan for Davao Oriental and Compostela Valley Province” (Post-Pablo LCAP)

The assessments were conducted using two participatory approaches – a roundtable discussion with experts from Eastern Mindanao and a household survey with affected communities in New Bataan (Figure 4). The discussion assessed the efficiency of the strategies in the three programs based on livelihood and agriculture support, hazard monitoring and information system, environment, risk governance and basic service provisions. From this discussion came sets of recommended actions to address the recovery and reconstruction challenges.

The survey assessed the affected communities’ preferences in terms of adaptation measures. To identify adaptation gaps, a comparison between the expert-recommended adaptation measures and communities-preferred adaptation measures was made.

Roundtable Discussion

The roundtable discussion provided a platform for the national and local government officials to discuss with NGOs and local/indigenous people’s organizations (POs) the challenges and opportunities in the recovery and reconstruction of the region’s economy and livelihood (Manuta, 2013). Reports of international and local NGOs were also presented and discussed.

Entitled “Challenges and Opportunities for Building Back Better and Resilient Post-Pablo Economy and Communities in Eastern

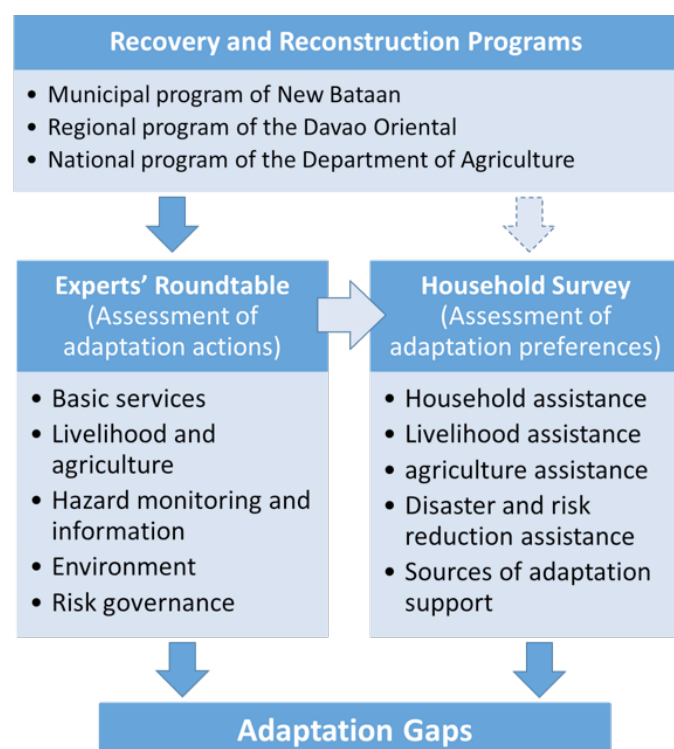


Figure 4. Analytical framework for the assessment of adaptation actions and preferences

Mindanao,” the roundtable discussion was held on 27 February 2013 at Ateneo de Davao University, Davao City, Philippines. Municipal officers of New Bataan and Laak from Compostela Valley and Caraga and Baganga from Davao Oriental represented the LGUs. The NGA representatives were from the DA, Department of Environment and Natural Resources (DENR), Mines and Geosciences Bureau (MGB), DOST, National Disaster Risk Reduction and Management Council (NDRRMC), Climate Change Commission (CCC), National

Economic Development Authority (NEDA), and Mindanao Development Authority (MINDA).

Among the international NGOs who participated were World Vision, Oxfam, Catholic Relief Services, Lutheran Relief, Handicap International, and Humanitarian Response Consortium. The local NGOs were represented by the Foundation for the Philippine Environment, Mindanao Migrant Center, Davao River Initiatives, Interface Development Interventions (IDIS), and Sustainable Integrated Area Development Initiatives in Mindanao-Convergence for Asset Reform and Development, Inc. (SIMCARRD).

Participants from the academe were from Ateneo de Davao University, University of Mindanao, and University of the Philippines-Mindanao, University of Southeastern Philippines, Holy Cross College, and University of the Immaculate Conception.

Other participants were from the United States Agency for International Development (USAID), United Nations Development Programme (UNDP) and various churches. The profile of the 128 participants is in Table 2.

Household Survey

Data collection. Household surveys in the villages of Andap, Cabinuangan, and Cogonon in New Bataan were conducted in November 2013. The survey questionnaire covered, among others, typhoon-induced disaster experiences, disaster recovery and adaptation strategies, and conjoint choices. Multiple-stage sampling was applied in selecting survey respondents. The first stage involved stratification at the municipal level wherein stratification criteria included level of damage and economic characteristics. The second stage of the sampling was determining the sample size at the village level. The sample size was calculated using the Cochran method at a 95% confidence level and 8% confidence interval. The resulting sample size (n) was 140, allocated to the three villages as follows: Andap - 35, Cabinuangan - 70, and Cogonon - 35. The third sampling stage involved stratification at the village level to capture different livelihood sources (e.g., agriculture [major crops and livestock], non-agriculture jobs) in the survey. Stratification at this level aimed to determine whether the nature of livelihood influences preferences for adaptation strategies. Finally, random sampling (i.e. random number generator) was employed in identifying respondents to be included in the survey.

Data analysis. Conjoint analysis is widely applied in academe and industry to measure preferences of individuals and assess trade-offs on goods and services (Hanley, Wright & Adamowicz, 1998; Lee, Choi, Lee & Kang, 2006; Green & Srinivasan, 1990). It has been used in different fields of study including environmental valuation (Farber and Griner 2000). In conjoint analysis, a set of attributes of environmental goods and services is used to describe the choices that are presented to individuals. The individuals' preferences on presented choices

Table 2. Profile of the participants of the roundtable discussion

Participants	Number of Participants		Total
	Male	Female	
LGUs Compostela Valley Province	12	1	13
LGUs Davao Oriental Province	7	5	12
CSOs Compostela Valley Province	1	-	1
CSOs from Davao Oriental	1	2	3
International NGOs	25	17	42
Local NGOs	9	8	17
Academe	8	7	15
NGAs	5	2	7
Other sectors	15	3	18
Total	83	45	128

Note: Local government units (LGUs), national government agencies (NGAs), non-government organisations (NGOs), and civil society (or people's) organisations (CSOs)

are assumed to be influenced by their subjective perceptions of these attributes. This implies that preferences are a function of an individual's economic, social, and cultural conditions (Acosta et al., 2016). In this paper, there are five attributes that define the choices for the conjoint analysis, which include household assistance, livelihood assistance, agriculture assistance, sources of assistance, and risk reduction measure for flood/landslide impacts (Table 3). The levels of the attributes conform to the adaptation recommendations from the roundtable discussion and represent the most relevant livelihood and agriculture support and risk reduction plans for the communities in the government's recovery and reconstruction programs. The choice tasks in the conjoint surveys are defined by the attribute levels. The combinations of the attribute levels were generated using a conjoint survey software called Sawtooth (<http://www.sawtoothsoftware.com/>). In addition to the construction of choice tasks for the questionnaire, Sawtooth was also used to compute the conjoint utilities. The utilities measure the relative desirability or worth of an attribute level (Orme, 2010a; Orme, 2006), which imply that attribute level with the highest utility value received the highest level of preference among survey respondents. The Hierarchical Bayes Choice-based Conjoint (HBCBC) model in the Sawtooth was used to analyze the utilities of the respondents (Orme, 2009).

Table 3. Attributes and attribute levels of the conjoint questionnaire

Level Number	Attributes				
	Household assistance	Livelihood assistance	Agriculture assistance	Sources of assistance	Risk reduction measure
1	Food supply	Crop production	Machine/Tools	Relatives/Friends	Prevent logging
2	Medicine supply	Livestock production	Seed/Seedlings	Farm associations	Stop mining
3	Shelter/ Housing	Agro-forest production	Livestock/Animals	Government	Regulate squatters
4	Money/Loan	Family business	Pesticides/Fertilizers	NGOs	Reforestation
5	Alternative livelihood	Non-agriculture job	Crop insurance	Church	Reduce soil erosion

Note: The attribute levels represent the types of adaptation assistance and measure that are relevant for the adaptation and risk reduction of the communities after the typhoon disaster. The attribute levels were identified from literature review (including the recovery and reconstruction programs, results of the roundtable discussion) as well as pre-testing of the questionnaire. The term “levels” do imply any ordinal sequence or logical order of the measures, but it is a jargon used in conjoint analysis.

Results

Highlights of Recovery and Reconstruction Programs

The responses of government, civil society, and the humanitarian community run the gamut from prompt support to ecosystem restoration: immediate, life-saving assistance to affected or displaced peoples; temporary and permanent shelter provisions; early re-establishment of livelihood; capacity-building for government and community to prepare for and respond to emergencies; and ecosystem restoration, among others (Manuta, 2013). Transitioning from the immediate, life-saving assistance at the initial stage of relief operations to the early reestablishments of livelihoods, the focus of attention in the Typhoon Pablo-affected areas is on long-term reconstruction and rebuilding processes.

“The Reconstruction and Development Framework 2013-2016” of the Municipalities of Baganga, Cateel, and Boston in Davao Oriental underscored the need to revisit and review the “Provincial Development and Physical Framework Plan,” and the “Municipal Comprehensive Land Use Plan (CLUP).” The “MAP New Bataan Comprehensive Rehabilitation and Recovery Program,” a convergence initiative of the LGU, NGAs, humanitarian and development agencies and CSOs, also echoed the same theme of ‘building back better.’ All recovery and reconstruction programs encouraged the participation of CSOs and NGOs in the implementation of community programs and projects to promote transparency, accountability, and participatory governance.

Post-Pablo recovery and reconstruction programs in Davao Oriental and Compostella Valley provided a window for “disaster-and climate-proofing” development and investment plans at the provincial and local levels. Disaster-and climate –proofing development and investment plans require mainstreaming of

Local DRR and Climate Change Adaptation (CCA) Management in the review and updating of the CLUP, Comprehensive Development Plan, and the Annual Investment Plan.

Both the “MAP New Bataan CRRP” and the “Post-Pablo LCAP for Davao Oriental and Compostella Valley Province” provided specific strategies for the recovery of the agricultural livelihood of the communities, including crops, livestock, and fisheries. Further, the LCAP of the two provinces included the provision of entrepreneurial and capacity building programs, which could help communities to diversify into non-agricultural businesses.

Adaptation Recommendations from the Roundtable Discussion

The main outcomes of the roundtable discussion were sets of action points for adaptation, which at the same time supported risk reduction initiatives. Participants recommended a number of regional action points that should have contributed to building a more resilient and adaptive economy and communities. These action points addressed fundamental issues on risk reduction. They thus supported ongoing recovery efforts in the region that aimed to reduce risk and vulnerabilities and strengthened capacities towards building better and resilient economies and communities.

The action points were grouped into four themes: (1) Livelihood and Agriculture, (2) Hazard Monitoring and Information, (3) Environment, and (4) Risk Governance (Table 4). A fifth theme referred to the provision of basic services, such as Education, Roof-a-School, and Health.

Livelihood and agriculture. Since the regional economy is primarily agricultural, recovery and reconstruction need to restore food security in such a way as to make the

livelihoods of the communities less vulnerable to these types of events in the future. Moving towards climate-smart agriculture and disaster-ready farming systems require economic approaches that incorporate changing climate patterns, such as crop suitability and land resources crop valuation, among others. This entails a change in direction for the local agricultural economy planning, which needs to account for market access, technical support, and low-cost fair capital inputs, among others. Regional livelihood diversification reduces the risks of

the region to extreme events. Diversifying agriculture crops and livelihoods in the region as well as increasing people's productivity ensures risk reduction in the future.

Hazard monitoring and information. Extreme weather events are not only occurring more often, they are also increasing in severity due to climate change. Climate change will result in the frequency and intensity of extreme weather events, as well as significant impacts for more gradual and creeping change (Intergovernmental Panel on Climate Change [IPCC], 2012; Turnbull, Sterrett & Hilleboe, 2013). Communities need to be more prepared: information on the risks and the occurrences of hazards should be made available and accessible to all, especially to the poor and the marginalized who most often live in the highest-risk areas. Early warning systems should be institutionalized and tools for hazard monitoring and mapping must be maximized so that local governments and communities can make informed decisions in planning and living their lives. Managing risks require a mindset that accommodates a high level of preparedness. The state and the private sectors also contribute to risk reduction by providing social instruments and programs for social protection and risk sharing, such as affordable crop insurance.

Environment. The reduction of forest cover in Eastern Mindanao has contributed to the vulnerability of the region to extreme events, such as Typhoon Pablo. Logging, mining, and plantation industries, among others, have contributed to the reduction of forest cover. The reduction of regional risks to hazards (extreme events) requires a critical review and assessment of the forest cover and land (resource) use in the region. This is seen as resulting in a framework that will promote reforestation using indigenous species to complement more sustainable land use practices. There is a need to review regional development policy and frameworks related to logging, mining, and plantation industries as well as the implementation and enforcement of the policy framework. The review should be done through the DRR-CCA lens to address the risks to and vulnerabilities of the community and environment. There is a need to prepare proactive plans to restore forest cover, diversify agricultural products to reduce vulnerability to economic and environmental impacts, minimize downstream impacts of economic activities (i.e., siltation of rivers), increase agricultural productivity and value so as to reduce the amount of land required to support the local population while increasing income for the local population.

Risk governance. Reducing regional risks of extreme events is primarily a governance issue. Mainstreaming DRR-CCA requires funding and political will. Existing land uses, zoning plans, and investment plans will need to be reviewed with a view to reducing vulnerabilities while increasing capacity. The review and assessment should be informed by lessons learned from the current situation and by interpolations of future risks brought about by the changing climate and other drivers.

Table 4. Action points for building resilience in Eastern Mindanao

Themes	What/How (Action Points)
1. Livelihood and Agriculture*	• Livelihood technology training (expertise-based) • Irrigation • Sustainability/ Organic farming (education and training, and policies) • Assistance for full recovery • Debris management in rural and upland areas • Policy review of crop insurance • Community enterprise from recyclables • Land resources crop evaluation (science-based), crop suitability assessment • Risk transfer sharing mechanism (social protection) • Banana industry (present threats) • Accessing World Bank, Global Environment Facility funds (loans) • Work Animal welfare • Cash for work/resources (seedlings, carabaos) for upland farmers • Rehabilitation plan for farms and forest
2. Hazard Monitoring and Information	• 3D hazard mapping and flood inundation models • Automatic Weather Station/rain gauges • Short messaging system (SMS)-based early warning systems • Information, education and communication (IEC) on disaster • Information sharing
3. Environment	• Revisiting of policies on mining, logging • Protected areas: watersheds, forests • Damaged ecosystems • Greenhouse gas management
4. Risk Governance	• Fund support/ action-planning for mainstreaming DRR- CCA • Review of land use/zoning plans • Sustainability mechanisms (state, civil society, business sector coordination) • Resources monitoring • Immediate training on DRR-CCA integration in programs, policies, activities • Vulnerability assessments to determine priorities

*Including concerns of the indigenous people

The roundtable discussion recommended three guiding principles (GPs) for operationalizing the action points. These principles are related to governance issues including partnership for resiliency (GP1), rights-based resilience (GP2), and participation of communities/peoples' organizations (GP3). The GP1 emphasizes that the main drivers in recovery and reconstruction are the LGUs together with the communities. The Governors and the Mayors, along with their respective administrators, should be driving the overall strategy while coordinating the efforts of all stakeholders. The partnerships must be equitable; arrangements and agreements must be transparent and fair, ensuring that raising the standard of living for those in the lowest socioeconomic percentiles closes the current equity gap. The GP2 emphasizes the need to address the issues of inequality and social justice that underpin the vulnerability and disproportionate risk and uncertainty of the poor and marginalized in Eastern Mindanao. The indigenous peoples, the migrants, the farmers, fisherfolk, women and children are the main vulnerable sectors that need to be included in the planning and implementation of the process. Finally, the GP3 recognizes the "culture of disaster" and "culture of coping" in the Philippines. This culture facilitates an understanding and appreciation of disaster as a result of the convergence of a hazard and people's vulnerabilities, including their resilience and existing capacities (Bankoff, 2007). It puts people at the forefront and at the core of DRR and adaptation programs. The active participation of the CSOs is essential to Building Back Better programs in Compostela Valley and Davao Oriental. The participation of the disaster-affected communities, peoples' organizations, and CSOs in the implementation of recovery and reconstruction projects is necessary to promote transparency and accountability in disaster risk governance.

Community Adaptation Preferences

Figure 5 and Table 5 present the results of the conjoint analysis. The former summarizes the importance of the different types of adaptation assistance, landslide risk

reduction and sources of adaptation and risk reduction assistance, while the latter reveals more details about the specific forms of household, livelihood and agricultural assistance as well as risk reduction measures preferred by the respondents. Conjoint "importance" measures the relative importance of the attributes to each other and, just like any percentages, has a meaningful zero point (Orme, 2010b). The attribute with the higher level of importance (or percentage) received higher preference among respondents. The results indicate that, with the conjoint importance of 44%, the household assistance is the most important type of adaptation support for the respondents across the different villages after flood and landslide events (Figure 5). This is because most of the respondents' houses and properties were heavily or totally destroyed by the flash floods and landslides (Eugenio et al., 2016). The next preferred adaptation support is livelihood assistance (conjoint importance of 18%) because many sources of livelihood particularly crop and livestock productions were devastated by the disaster.

Except for money or loan, all forms of household assistance are statistically significant (Table 5). Food supply is the most significant form of household assistance for the respondents. Relative to the food supply, other forms of household assistance are less important as shown by their negative coefficients. For livelihood assistance, only crop production has statistically significant positive coefficient indicating its relative importance for the respondents. Machine and tools are the specific forms of assistance that the respondents would prefer to receive for their agricultural production. The coefficients of all other forms of risk reduction measures are statistically insignificant. Only the reduction of soil erosion is considered important by the respondents. During the survey, respondents agreed that logging and mining are important causes of landslides in their villages. Nonetheless, control of logging and mining is not considered as important risk reduction measures because these provide them sources of livelihoods. Moreover, agro-forestry is not preferred livelihood assistance and deforestation is not preferred risk reduction measures.

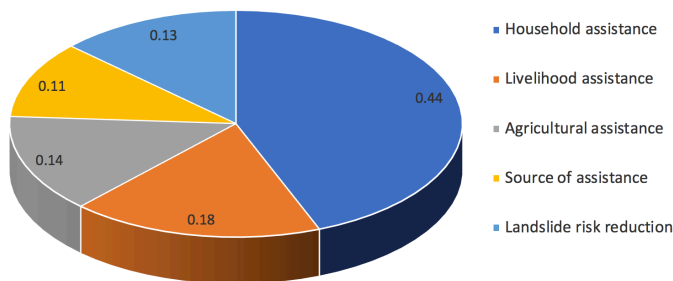
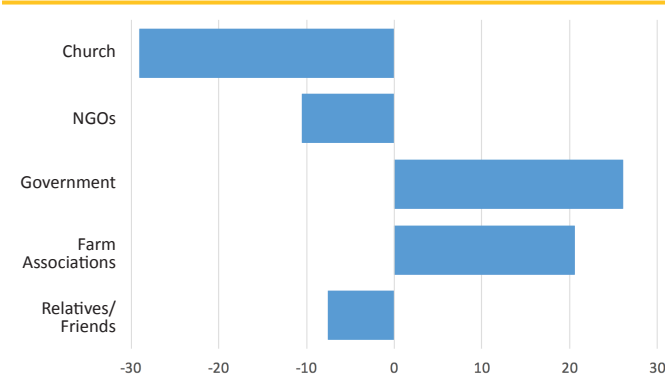
Table 5. Logit estimation results of the utilities for the different forms of adaptation support

Assistance	Estimate	t-ratio	Assistance	Estimate	t-ratio
Household			Agricultural		
Food supply	0.328***	4.561	Machines/Tools	0.074*	0.993
Medicine supply	-0.075*	-0.971	Seed/Seedlings	-0.040	-0.519
Shelter/Housing	-0.086*	-1.112	Livestock	-0.004	-0.047
Money/Loan	-0.034	-0.438	Fertilizers	0.036	0.482
Alternative livelihood	-0.134**	-1.701	Crop insurance	-0.067*	-0.872

Table 5. Continued

Assistance	Estimate	t-ratio	Assistance	Estimate	t-ratio
Livelihood			Risk reduction		
Crop production	0.119**	1.602	Prevent logging	-0.016	-0.216
Livestock production	-0.074*	-0.957	Stop mining	0.041	0.533
Agro-forest production	-0.061	-0.789	Regulate squatters	-0.050	-0.645
Family business	0.004	0.046	Do reforestation	-0.058	-0.751
Non-agriculture job	0.013	0.166	Reduce soil erosion	0.083*	1.113

Note: Asterisks indicate coefficients significantly different from zero at different levels of significance $\alpha=0.025$ (***), $\alpha=0.10$ (**), and $\alpha=0.20$ (*), respectively. The attribute values with positive utility values are preferred by the respondents, where the higher the positive values the higher the preference level. In contrast, those with negative utility are not preferred, where the higher the negative values the lower the preference level. The signs and values of the utilities thus measure the level of preferences for each attribute level.

**Figure 5.** Conjoint importance by type and source of adaptation support**Figure 6.** Conjoint utility values for the sources of adaptation assistance.

Note: The values are zero-centered. Negative values are less preferred sources, and positive values are more preferred sources of adaptation assistance.

The conjoint importance of the sources of assistance is low at 11% (Figure 5). The utilities of the sources of assistance are all insignificant, which imply that the communities which were surveyed are not too particular about where the assistance is coming from. This can be explained by the fact that they have received different types of support from various organizations for almost a year (Annex 2). The survey also revealed that most of the funds (44.7%) for the reconstruction of their houses came from donations of religious organizations, NGOs, and cooperatives. In terms of order of importance, however, governments ranked first with a positive utility of over 25 (Figure 6). Church turned out to be the least important source of adaptation assistance. This reflects the Church's limited ability to provide the types of support the communities require.

Gaps and Challenges in Adaptation Measures

A comparison of the roundtable-recommended action points with the results of the survey and conjoint analysis reveals the critical need to increase representation of affected people in future roundtable discussions and awareness building of all vulnerable communities in the region. Below are some discrepancies between the roundtable-recommended actions points and the results of the survey and conjoint analysis.

- Actions on livelihood and agriculture (Theme 1) should consider the livelihood preference (e.g., crop production) and support (e.g., farming tools) of the target beneficiaries.
- Actions on crop insurance (Theme 1), which is important for social risk management, has very low preference among the surveyed communities.
- Actions on hazard monitoring and information (Theme 2) is crucial to encourage more people in vulnerable areas to evacuate their families to the government-designated sites, where they have easy access to relief goods and services.
- Actions on logging and mining (Theme 3) did not turn out to be important for the communities.
- Actions on restoration of forest coverage (Theme 3) will not

be easy to implement as communities express little importance and very low preference for agro-forestry.

On the one hand, the adaptation preferences of the communities do not support the recommended action points from the roundtable discussion. To address the adaptation gaps, which are crucial to risk reduction efforts, the communities need to have increased awareness of the need to reduce logging and mining, restore forest cover, and have access to crop insurance.

On the other hand, the recommended action points do not reflect some of the adaptation concerns of the communities. The action points do not include any strategy for relief support (i.e., household assistance) after disasters. The conjoint analysis reveals that this is the most important adaptation for the communities, particularly food supply. Moreover, the communities prefer support for reducing the soil erosion problem, which was not specifically identified in the action points. While soil erosion can be subsumed into the rehabilitation of damaged ecosystems, capacity building on sustainable farming practices that will reduce soil erosion will address this adaptation gap.

As regards governance for risk reduction (Theme 4), the results of the conjoint survey turned out to be consistent with the preferences of the communities. While the roundtable recommended partnership among various stakeholders, the participants emphasized the key role of government at various levels in driving the strategy and coordinating the efforts for recovery and reconstruction. Similarly, while the surveyed communities do not have particular preferences on the sources of adaptation assistance, they consider the government as the most important source of assistance. This implies that the recovery and reconstruction programs should be implemented under participatory governance, with the government providing overall guidance to the stakeholders.

Conclusions

The immediate future is critical as new investments and projects for reconstruction and rehabilitation start pouring into the region. Rebuilding a better and safer post-Typhoon Pablo development environment requires that these investments, projects, and funds for the recovery and rebuilding of people's lives and livelihoods in Eastern Mindanao are implemented correctly to address both the root causes of the issues that have been exposed due to the impact of Typhoon Pablo and the gaps in adaptation measures.

Awareness building and active participation of communities and POs in risk reduction programs are essential in addressing the gaps in the adaptation measures. Awareness building can be combined with capacity building on entrepreneurship and alternative livelihoods because the lack of alternative livelihood is one of the major reasons for logging and mining in New Bataan. The active participation and engagement

of the communities and PO's in the different phases of risk reduction and adaptation programs—from preparedness to relief to recovery and reconstruction—contribute to a better understanding of the root causes of peoples' vulnerabilities and the structures or conditions that generate them.

Regular monitoring and assessment not only of the recovery and reconstruction efforts but also of the needs and preferences of Typhoon Pablo-affected communities are essential to ensure that interventions and efforts undertaken both at the local and regional levels are geared towards what development and humanitarian communities call "disaster-proofing" the development trajectory in the region. This is crucial for enhancing people's resiliency and adaptive capacity to deal with similar disasters in Eastern Mindanao in the future.

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Annex 1 Recovery and Reconstruction Programs in Eastern Mindanao

A. Moving Up After Pablo (MAP) New Bataan Comprehensive Rehabilitation and Recovery Program

Overview

The onslaught of Typhoon Pablo at the breaking of dawn on December 4, 2012, has tremendously devastated the remote yet promising town of New Bataan in Compostela Valley Province. The place was marred with unimaginable damage and loss of lives. As Typhoon Pablo left the barely flattened town of New Bataan, humanitarian assistance and relief operation activities coming from both government and non-government sectors also quickly flooded in.

Moving-up After Pablo (MAP) Program is a convergence initiative of the Municipal Local Government Unit (MLGU) of New Bataan, the Department of Agriculture- Support to Emergency Livelihood Assistance Program (DA-SELAP), Oxfam, Humanitarian Response Consortium (HRC), and SIAD in Mindanao-Convergence for Asset Reform and Regional Development (SIM-CARRD) that basically intends to draw a comprehensive rehabilitation and recovery plan for New Bataan after the calamity caused by Typhoon Pablo.

Goal

- Good and equitable socio-economic program for recovery instituted.
- Objectives for recovery and rehabilitation assistance anchored in honest and judicious socio-economic reform, good governance and poverty reduction.
- Assistance for the recovery program, activities and projects harmonized.
- Livelihood projects and programs for sustainable development promoted and prioritized.

Objectives

- To assist the local government unit of New Bataan in crafting a comprehensive recovery and rehabilitation program after the calamity caused by Typhoon Pablo that will serve as a roadmap and master plan for sustainable development.
- To harmonize humanitarian assistance and relief operation activities and recovery program based on the LGU's identified quick-fix interventions and recovery plan base on a short-term, medium-term and long-term framework.
- To help identify priority-assistance through the LGU's barangay/s development plans (BDPs) vis-à-vis calamity report.
- To organize local teams/clusters that will facilitate and supervise the delivery of assistance and implementation of rehabilitation and recovery projects, activities and programs.
- To assist the LGU in the identification and organizing typhoon-affected individuals, families, and communities for an equitable, orderly and systematic distribution of relief

goods and services as well as proper implementation of rehabilitation and recovery programs.

- To match and knit the identified priority and felt needs of the LGU and its community to the Convergence Program of the national government and of the humanitarian community for recovery and rehabilitation.

Top Priorities for Agriculture

1. Provision for corn, rice and vegetable seeds, farming tools and equipment.
2. Livestock and poultry production.
3. Planting materials especially for cacao, coconut, and coffee production.
4. Inputs for inland fish farming.
5. Training and assistance for organic agriculture and organic feeds and fertilizer production.

Top Priorities for Social Infrastructure

1. Rehabilitation of water system facilities.
2. Housing and socialized shelters.
3. Rehabilitation of farm to market roads.
4. Rehab or replacement of damaged hanging bridges.
5. Rehabilitation of irrigation systems.
6. Water spring development projects.
7. Evacuation Centers

HEALTH

1. Medicines and health care program
2. Establishment of Health Centers with medical supplies.
3. Continued feeding program for children.
4. Replacement of Barangay Ambulance.
5. Establishment of "*Botica sa Barangay*".

Education

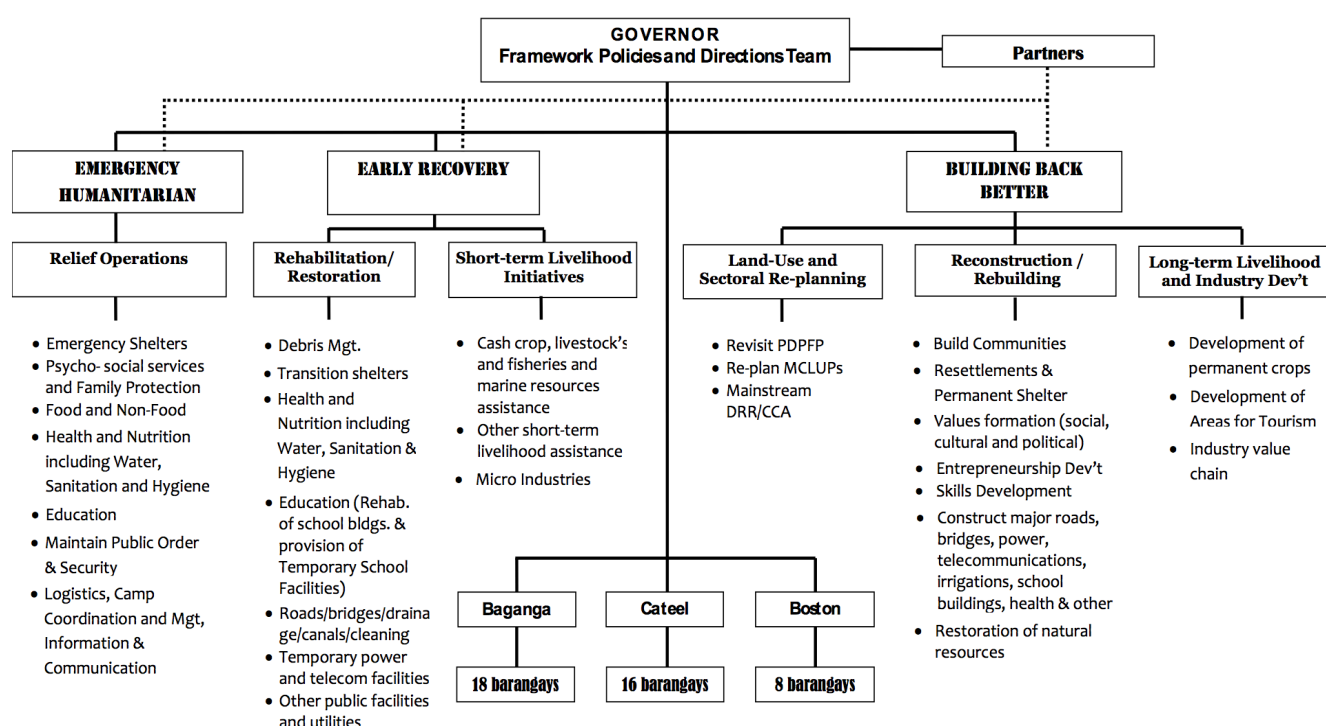
1. Rehabilitation and repair of damaged school buildings including furniture and fixtures.
2. Provision for additional school desk and chairs.
3. Provision for textbooks and school supplies.
4. Provision for schools tools and materials for home economics, carpentry, and gardening.
5. Scholarship program.
6. Continued counseling, stress-debriefing, and psychosocial activities.

B. Reconstruction and Development Framework 2013-2016 in Davao Oriental (Municipalities of Baganga, Cateel, and Boston)**Reconstruction and Development Framework**

Stages	Action Agenda	Timeline
Emergency Humanitarian Response	• Relief Operation	Dec 2012- June 2013
Early Recovery	• Rehabilitation and Provision of Food	January 2013-December 2013
Building Back Better	• Land Use and Sectoral Planning (Mainstreaming Disaster Risk Reduction and Climate Change Adaptation) • Reconstruction • Livelihood and Industry Development	January 2013- December 2016

Building Back Better Stage

Tasks	Goods and Services
Revisiting the approved Provincial Development & Physical Framework Plan (PDPFP)	• Data updating, land use modification, and re-zonification
Re-planning of the Municipal Comprehensive Land Use Plan (MCLUP)	• Mainstreaming the DRR-CCA • Identification of opportunities for development (e.g. agriculture, industry, tourism, and environment)
Pursuing Appropriate Legislative Actions	• Adoption of an updated land use plan • Zoning ordinances
Project Development	• Project proposals
Provision of goods and services for agriculture, industry and tourism development	• Development of agricultural areas for permanent crops • Development of industry value chain • Development of areas for tourism

Davao Oriental Convergence Framework

C. Post Pablo Livelihood Cluster Action Plan for Davao Oriental and Compostela Valley Province

Background

Davao Oriental and Compostela Valley Province are rich in natural resources with the fertile agricultural land, rich in fishing grounds and mineral deposits. The major products in agriculture and fishery are coconuts, pomelo, mango, rice, corn, banana, abaca, and fish, among others. Davao Oriental is known nationwide to be the largest area with coconut planted with a total area of 155,905 hectares (BAS, 2011).

In Compostela Valley Province, typhoon Pablo devastated around 75,887.6 hectares of agricultural lands planted with rice, corn, coconut and high-value crops (for export) like banana, rubber, cacao, coffee, and vegetables palm oil, among others; 296.0 hectares in fishery; and 30,758.0 hectares of forestry (PAGRO Compostela Valley Province, 2013). The total damage of agriculture, fishery, and forestry is pegged at PHP 14.4 Billion and the production losses in the agriculture sector are estimated at PHP 7.5 Billion. The assessment of

losses in the agriculture sector in the province was based on the computed difference between the pre-disaster and post-disaster production volume multiplied by the farm gate prices of specific commodities.

In Davao Oriental, the estimated damage in the agriculture, fishery, and forestry is PHP 747 Million and the production losses are PHP 624 Million.

The recovery and reconstruction framework is anchored on the building-back-better and safer principles. Initiatives are geared toward restoring the capacity and capability of the affected sector to act and move-on inconsiderable amount of disaster risk planning and development, thus helping communities to help themselves.

Objectives:

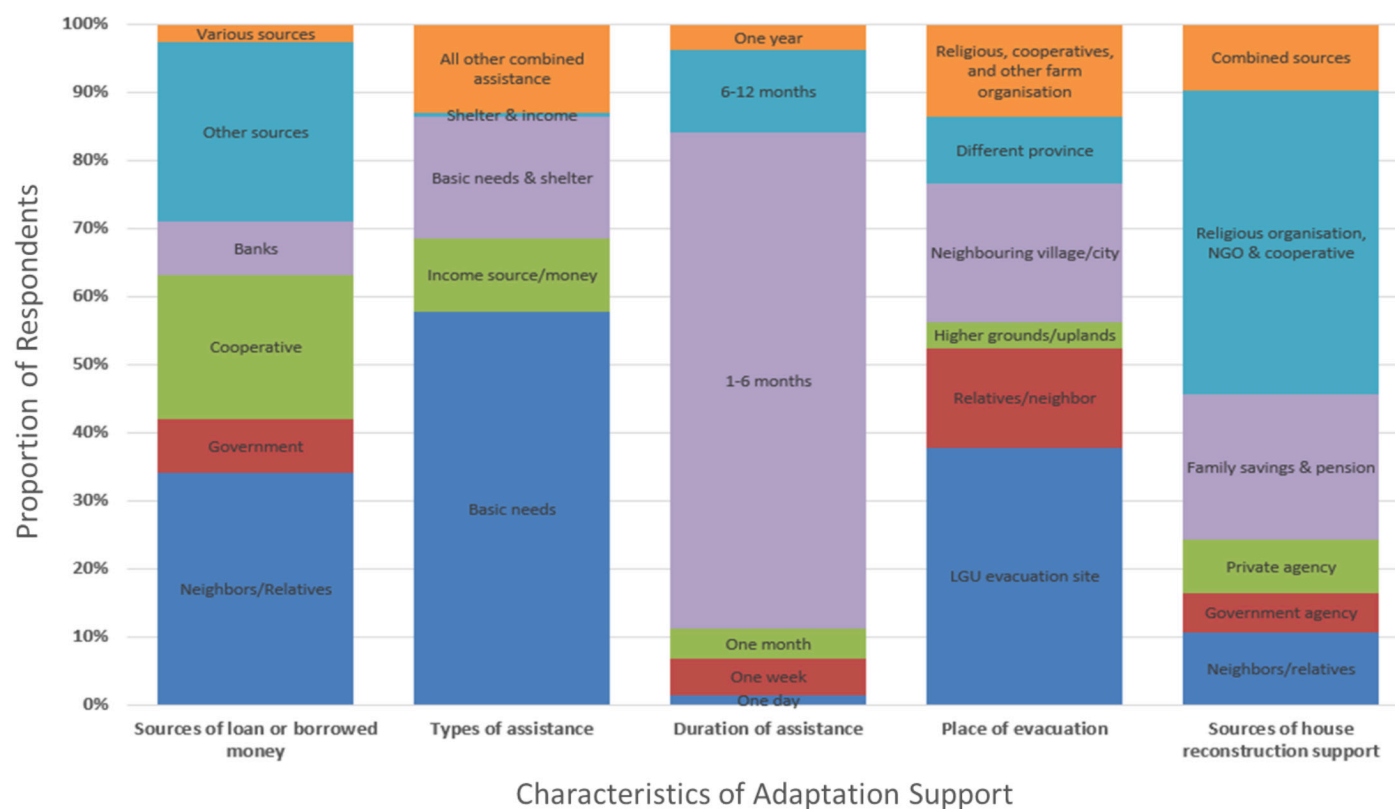
- (1) To rehabilitate and protect the typhoon- damaged agro-forestry plantations, livestock and fishery industries; and
- (2) To provide livelihood opportunities and expand the income base of affected communities.

Brief Descriptions of Strategies, Major Programs, and Projects

Sector	Areas	Short Term	Medium Term	Long Term
Agriculture	Crop Production	1. Rehabilitation of damaged crop farms	1. Continuous production of crops	1. Continuous production of crops
		2. Production of crops e.g. banana, coconut, rice, corn & cassava, sweet potato, cacao, coffee, peanuts, vegetables, soybeans, abaca, bamboo, rubber	2. Provision of machinery, equipment and harvest facility	
	Forestry	1. Reforestation (including bamboo)	1. Continuous reforestation	1. Continuous reforestation
	Livestock & Poultry	1. Rehabilitation of damaged livestock farms	1. Reconstruction of slaughterhouses	1. Continuous breeding of livestock and poultry
		2. Restocking of breeders	2. Provision of animal health programs	
	Fishery	1. Rehabilitation of damaged fish sanctuaries and mangroves	1. Continuous rehabilitation of fish cages and provision of fishing gears	1. Continuous rehabilitation of fish cages and provision of fishing gears
		2. Restocking of fingerlings		
		3. Provision of fishing boats and gears		
Industry, Trade and Services		1. Provision of entrepreneurial and capacity training program	1. Continuous provision of entrepreneurial and capacity training program	1. Continuous provision of entrepreneurial and capacity training program
		2. Provision of shared service facilities	2. Continuous provision of shared service facilities	2. Continuous provision of shared service facilities
		3. Provision of credit assistance	3. Continuous provision of credit assistance	3. Continuous provision of credit assistance 4. Marketing assistance

Source: Draft post Disaster Needs Assessment Report for Typhoon Pablo Davao Region as of 18 February 2013

Annex 2 Experiences with disaster assistance and house reconstruction of the surveyed communities in New Bataan, Compostela Valley



Source: Author's own computation from survey data

Note: The color on the figure represents the range of the data and is described by the characteristics written on each data range.