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# Local adaptation for livelihood resilience in Albay, Philippines

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Local adaptation to climate change is essential for vulnerable coastal communities faced with increasing threats to livelihood and safety. This paper seeks to understand the micro-level enabling conditions for climate change adaptation through a livelihood lens in a study of six coastal villages in Bacacay in the province of Albay, Philippines. Albay is a high-risk province due to hydro-meteorological and geophysical hazards. The analysis of livelihood resilience utilizing the Sustainable Livelihoods Approach shows that a soft adaptation strategy focusing on enhancing human and social capital needs to be undertaken to increase adaptive capacity and build resilience in the study area. Moreover, the micro-level variations in the villages suggest that the understanding of local conditions is indispensable in planning and formulation of appropriate adaptation strategies and actions at local level.

Keywords: local adaptation; livelihood resilience; sustainable livelihoods approach

## 1. Introduction

Climate change and its impacts, especially in terms of extreme weather events and disasters, have been increasingly felt in recent years. The vulnerability of developing countries like the Philippines has likewise risen because of the uncertainty and risk that climate change brings. In light of the IPCC Fourth Assessment Report's conclusion that climate change has begun to affect the frequency, intensity and length of many extreme events such as storms, floods, droughts and extreme temperatures, there is an urgent need for timely and effective adaptation to be undertaken (IPCC, 2009).

Coastal communities, being at the forefront of climate change, continually have to cope with its impacts. Climate change impacts on coastal areas have been dealt with extensively in various studies. In particular, McLean et al. (2001) and Nicholls et al. (2007) in the IPCC Third and Fourth Assessment Reports highlight the implications of climate change for coastal systems and low-lying areas; Klein and Nicholls (1999) summarize the nature of the challenge

that coastal zones face given sea-level rise and present a conceptual framework for vulnerability assessment of coastal zones to sea-level rise; and Leary et al. (2006) provide case studies on coastal area and small island vulnerabilities undertaken by the international project, Assessments of Impacts and Adaptation to Climate Change. Essentially, population pressure, increasing demands for space and resources, and poor economic performance can all undermine the sustainable use of oceans and coastal areas (UNEP, 2008). Added to these are the environmental, economic and social challenges that climate change brings to coastal areas. For instance, coastal erosion impacts on undeveloped shorelines as well as on coastal development and infrastructure and rising temperatures lead to bleaching of coral reefs (Field et al., 2001); livelihoods in tourism are threatened (Payet, 2007); and health is affected by increased incidences of disease that follow floods (Reid et al., 2007). Coastal communities, characteristically dependent on fisheries and agriculture for livelihood, have to deal with these increasing threats to environment and livelihood as well as safety.

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Human ingenuity and adaptability is well recognized in the climate change issue. Human beings have been adapting to the variable climate around them for centuries at many spatial and temporal scales. It is embedded in human systems that take into account the prevailing climatic condition. Especially at the local scale, climate variability influences peoples' decisions with consequences for their social, economic, political and personal conditions, and effects on their lives and livelihoods (UNFCCC, 2007). Constant challenges in human well-being give people the ability to persist through mostly autonomous coping mechanisms and survival strategies.

Adaptation is fundamentally defined in climate change literature as adjustments in a system in response to climatic stimuli. It is a complementary strategy along with mitigation to effectively manage climate change risks. Adaptation can be approached by focusing on the impacts of climate change, or by reducing vulnerability to climate change in the course of reducing vulnerability in general (McGray et al., 2007). However, a line does not necessarily need to be drawn between vulnerability reduction interventions (e.g. livelihood diversification, literacy promotion and capacity-building activities) and impacts-targeted measures (e.g. responses to glacial melting and relocation in response to sea-level rise) when they can be seen in a continuum of approaches. In this way, adaptation efforts can encompass a wide range of development concerns from activities that reduce poverty and build capacity to activities that address risks and climate change impacts.

Local adaptation activities have received much attention in recent years because of autonomous actions of communities and the need to mainstream climate adaptation into the development process (Douma and Hirsch, 2007; Ensor and Berger, 2009; Olhoff and Schaer, 2010). At the local level, adaptation is about strengthening communities, building on their own coping strategies to live with climate change and empowering them to participate in the development of climate change policies (Reid et al., 2007).

Adaptation is highly site specific and thus local actors play a critical role in achieving real impact on the ground. For instance, the local government plays a key role in building an enabling environment for adaptation. In terms of policy, the support of local government can contribute to expeditious adaptation actions. Critical factors to achieving a significant level of impact include the capacity of those taking actions, the information available at the local level and funding support for adaptation initiatives (McGray et al., 2007; IFRC and ProVention Consortium, 2009).

Decisions about adaptation strategies and actions are made at a range of levels from national down to the community (Carter and Raps, 2008). The urgency of the climate change issue has stimulated action and commitment of national governments in terms of creating policy and strategy to address climate change. At the national level, however, few strategies have been developed that take into account the local context or are tailored to different local scenarios. Congruence is often non-existent between national and provincial frameworks and village-level policy. Recognition of the importance of local context is lacking during planning and formulation of adaptation strategies. Because of this, adaptation efforts fall short to achieving real impact on the ground.

### ***1.1. Rationale for livelihood resilience***

The need to focus on livelihoods arises because livelihoods of the rural poor are rooted in the productivity of ecosystems that climate change is already altering (IISD et al., 2003; Bapna, et al., 2009). For these vulnerable communities, climate change brings added risks that test adaptive capacity. As income and food security, among others, are threatened by climate change, households and communities require the skills, assets and other resources necessary to adapt to changes. The diversity, amount and balance between assets influence how community members view their own well-being and

resilience (Marschke and Berkes, 2006; IFAD, undated). Resilience demonstrates the persistence of relationships within a system and is a measure of the ability of these systems to absorb changes of state and driving variables and parameters and still persist (Holling, 1973; Folke et al., 2002). It is determined by the degree to which the community has the necessary resources and is capable of organizing itself both prior to and during times of need. Thus, livelihood systems must be sufficiently resilient and livelihood strategies must be robust to enable people to absorb the shocks and stresses associated with climate variability.

This paper aims to understand the micro-level enabling conditions for climate change adaptation (CCA) that will build livelihood resilience utilizing the Sustainable Livelihoods Approach (SLA) in six coastal villages of Bacacay in Albay province in the Philippines. In the following, the study area and methodology are described, and the results of surveys, interviews and focus group discussions on perceived climate change and disaster risk vulnerability, structures and institutions, and local adaptation strategies are shown. Analysis of livelihood assets through asset pentagons of the six villages is done. Finally, the implications of local adaptation for livelihood resilience in coastal communities are discussed.

## 2. Characteristics of the study area

### 2.1. Profile

The province of Albay in the Philippines is located in the southernmost tip of Luzon in a region of low growth, high unemployment and a multitude of impoverished families. Bacacay is one of the biggest fishing municipalities in Albay. It consists of 12 inland and 24 island coastal villages hosting a rich diversity of coastal resources and habitats. Among these, six villages were selected for the study: Sogod, Igang, Bariw, Uson, Busdac and Misibis (Figure 1). Bacacay has a population of 61,574 people in 11,154

households (2007 Census). The livelihood of its coastal communities is highly dependent on harvest from coastal waters, *karagumoy* (Pandan leaf) and *abacá* (hemp) for handicraft and coconut plantations.

Agriculture is the main industry in Albay, producing crops such as coconut, rice, corn, vegetables, sugarcane, pineapple and *abacá*. The principal crop in Albay is coconut, which occupies 95,794 ha of cultivated land. Handicraft making is also a major source of income. The manufacture of *abacá* and *karagumoy* products such as mats, bags, hats and slippers supports small-scale industries in the rural areas. Furthermore, fishing is a major occupation since the province's 354 km of coastline sustains a variety of marine resources and is a source of high-value fish, including grouper, milkfish, siganid, mudcrab and prawn. The majestic Mayon Volcano with its perfect cone draws tourists to the region and provides tourism income to Albay. Likewise, beautiful beaches and resorts contribute to tourism and support many coastal municipalities.

### 2.2. Climate and disaster risk context of Albay

The province of Albay is bounded by the Pacific Ocean on the east, Samar Sea on the southeast and Sibuyan Sea on the southwest. This location gives the province a 16 per cent frequency probability of experiencing typhoons. An average of 20 typhoons enter the Philippines every year, most of them often passing through the Bicol region en route from southern Philippines in a northwesterly direction. According to the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), 86 tropical cyclones have passed within 50 km of Albay in a period of 58 years mostly during the months of October to December. Albay was seriously affected by the typhoon disaster caused by Typhoon Reming in November 2006 (Table 1). Strong winds of up to 250 kph and torrential rains of a record high of 446 mm that came with the typhoon as well as earlier



**FIGURE 1** Study area showing the location of villages: Sogod (1), Igang (2), Bariw (3), Uson (4), Busdac (5) and Misibis (6).

eruptions of Mayon Volcano triggered mudslides that destroyed villages along its path.

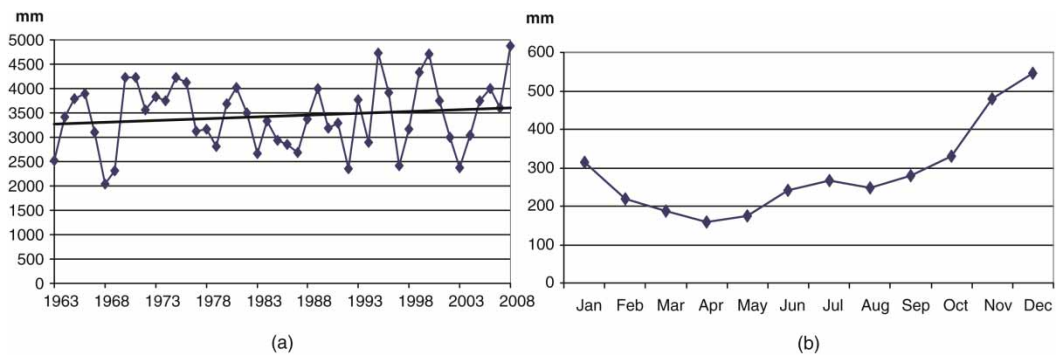
Albay's climate is categorized as Type II, which is described as no dry season with pronounced maximum rainfall from November to January.

The annual rainfall trend for the period 1963–2008 shows a gradual increasing trend averaging at 3,416 mm, as shown in Figure 2a. The average monthly rainfall is 285 mm with a maximum average of 533 mm in December and a

**TABLE 1** Damages by tropical cyclones in Albay from 1994 to 2006

	Name of typhoon	Year	Strength (kph)	Affected population				Total amount of damages (in USD)
				Number of people	Number of dead	Number of injured	Number of missing	
1	Akang	1994	54	18,036	47	112	1	2,211,904
2	Garding	1994	80	6,799	1	2	1	1,546,644
3	Mameng	1995	97	10,126	0	0	0	1,588,884
4	Rosing	1995	137	440,372	44	20	2	11,991,106
5	Pining	1997	90	1,800	0	0	0	836,956
6	Loleng	1998	130	201,834	1	7	1	6,754,448
7	Sendang	1999	60	1,122	0	0	0	2,444
8	Reming	2000	110	27,547	12	1	2	7,188,989
9	Senyang	2000	150	22,882	0	0	0	91,111
10	Dindo	2004	170	33,892	0	6	1	5,038,046
11	Unding	2004	100	1,744	0	0	0	942,094
12	Yoyong	2004	100	18,372	0	10	1	1,124,229
13	Caloy	2006	65	47,065	0	5	0	2,207,708
14	Milenyo	2006	130	698,460	14	176		37,007,025
15	Reming	2006	209	1,060,875	604	1,465	419	71,787,460
Total								153,419,031

Source: Albay Provincial Safety and Emergency Services Office (APSEMO).



**FIGURE 2** Rainfall trends in Albay for the period 1963–2008. (a) Annual average rainfall and (b) average monthly rainfall.

Source: PAGASA, analysed by the author.

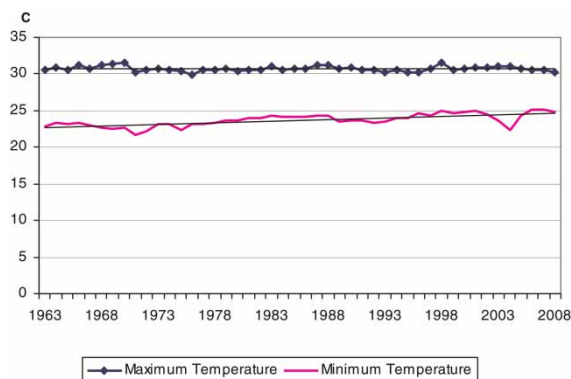
minimum average of 157 mm in April. Rainfall occurs at its maximum in the months of October to January (Figure 2b). Maximum temperature in Albay occurs in May and June at 32°C and minimum temperature occurs in January and February at 22°C. The trend of annual average maximum temperature as depicted in Figure 3 does not show a significant pattern but illustrates a steady increase in the average minimum temperature showing a trend towards hotter than colder days.

In general, Albay is considered a high-risk province due to hazards brought about by volcanic eruptions, landslides, earthquakes, floods and typhoons. Along with typhoons, volcanic

eruption is a common risk primarily because Mayon Volcano is highly active bringing with it hazards such as airfall tephra, lava flows, pyroclastic flows and lahars. Climate change is expected to worsen the impacts of weather-related events in the province. Some of the potential climate change impacts to Albay include sea-level rise, increased rainfall, intense and frequent typhoons and warmer temperatures.

### 2.3. Institutional context

The provincial government of Albay has exhibited strong political will and great enthusiasm for climate-friendly development. Because of the province being highly disaster prone, the local government has taken a proactive role in addressing disaster and climate risks. Disaster risk reduction (DRR) and CCA are the principal considerations of the strategy on disaster- and climate-proof development in the province. In combating climate change, the Provincial Government of Albay has developed a programme called Albay in Action on Climate Change (A<sup>2</sup>C<sup>2</sup>). It has institutionalized the Centre on Initiatives and Research on Climate Adaptation (CIRCA) and the Albay Provincial Safety and Emergency Management Office (APSEMO) to undertake initiatives in CCA and DRR, respectively (Lasco et al., 2008). CIRCA, for instance, plays a key role in mainstreaming CCA in the



**FIGURE 3** Temperature trends in Albay for the period 1963–2008.

Source: PAGASA, analysed by the author.



education sector by developing basic education curriculum incorporating climate change and training teachers on its use. In addition, the centre has provided workshops to local government officials to enhance knowledge and awareness on climate change as well as trainings in technologies to use in revisiting the province's Comprehensive Land Use Plan (Plan International, 2010).

Moreover, the province has taken a high-profile stance in CCA advocacy by convening the National Conferences on Climate Change Adaptation (NCCCA). The first NCCCA in Albay in October 2007 produced the Albay Declaration on Climate Change, which was instrumental in pushing forward CCA into the national agenda. The second NCCCA held in October 2009 made an appeal on CCA to the Philippine president through the Manila Declaration 2009. The Philippine Climate Change Act of 2009 was finally approved on 23 October 2009 taking much of its substance from the conferences' declarations.

3. Methodology

The study used qualitative and quantitative methods in the form of questionnaire surveys, key informant interviews and focus group discussions carried out in July and August 2009. The coastal villages of Sogod, Igang, Bariw, Uson, Busdac and Misibis were selected based on fisherfolk population, livelihood diversity and coastal resources management activities. A brief description of the six villages is presented in Table 2.

TABLE 2 Description of study villages

Name of village	Area (in km <sup>2</sup> )	Location	Number of households	Main livelihood
Sogod	2.75	Mainland	660	Fishing
Igang	1.65	Mainland	352	Fishing
Bariw	2.50	Mainland	95	Farming
Uson	1.87	Island	129	Fishing
BUSDAC	2.05	Island	195	Mat making
Misibis	3.48	Island	125	Fishing

The SLA provides a useful tool for analysing livelihoods and therefore was utilized in this study. In recent times, the SLA has gained relevance as a tool in mainstreaming DRR and CCA because it considers vulnerabilities of all kinds as central to the ways in which livelihoods are shaped (Benson and Twigg, 2007). The SLA seeks to understand the factors that affect the livelihoods of the poor by examining the vulnerability context, livelihood assets, and transforming structures and processes that result in livelihood strategies aimed at achieving certain outcomes. The design of the questionnaire was primarily adapted from the SLA framework. The questionnaire was of a multiple-choice type and questions focused on climate change and adaptation practices, disaster risk management, governance and institutions, livelihood assets and livelihood strategies to understand the vulnerability context, livelihood assets, and structures and processes in the study area. The survey targeted heads of households in order to obtain the best information on family livelihood. There were a total of 187 survey respondents, most of whom were males (87.6 per cent) and heads of households (76.5 per cent). In particular, there were 18 respondents in Bariw, 20 in Busdac, 39 in Igang, 19 in Misibis, 70 in Sogod and 21 in Uson, representing 18.9, 10, 11.1, 15, 10.6 and 16.3 per cent of the total number of households, respectively.

Livelihood assets were quantified using indicators and measures listed in Table 3 and the results depicted through livelihood asset pentagons. Respondents were asked to answer questions for each measure in a scale (e.g. percentage, duration, range, degree), and these were calculated by using weighted average. Each measure to be averaged is assigned a subjective weight based on the relative importance given to the measure by respondents. No statistical test was run in developing the asset pentagons. Livelihood asset pentagon scores are given the scales 5 (very high), 4 (high), 3 (moderate), 2 (low) and 1 (very low).

To deepen our understanding and to address the feedback loops in the SLA framework, key informant interviews were carried out with 13

**TABLE 3** Indicators and measures of livelihood assets

Asset	Primary indicators	Measures
Natural	Natural endowment	Existence of mangroves, forests, seagrass beds, tidal flats and coral reefs
	Land	Land and livestock ownership
	Livestock	Size and percentage of land farmed
Physical	Infrastructure	Existence of basic infrastructure
	Housing	Type and ownership of housing
	Property ownership	Household asset and livelihood implement ownership
Financial	Income	Source of income
	Livelihood	Income from livelihood
	Access to credit	Existence of credit facility
Human	Occupation	Number of years in occupation
	Training and technology	Availability of training and level of technology
	Health	Access to health services and facilities
Social	Social organization	Existence of social organizations
	Membership in organization	Benefit from membership in organizations
	Communication network	Information dissemination

officials from the municipal government, village councils, various local government agencies and local non-government organizations. In addition, focus group discussions were conducted in three villages, namely Bariw, Sogod and Uson, with 9, 10 and 12 participants, respectively, composed mainly of members of the village council, members of fishermen and farmer associations, women and church groups, and community residents. The discussions essentially focused on laws, policies and institutions and the vulnerability context as well as recommendations for livelihood strategies. The qualitative information obtained was incorporated in the analysis of findings to complement or contradict the results obtained from the quantitative examination of livelihood assets.

A number of limitations to this study should be recognized. Information on livelihood assets is based on individual perceptions, which could not be verified objectively. Furthermore, a major limitation affecting the robustness of the livelihood asset pentagon scores is that only measures that can be converted into unit-less measures and can be aggregated were included, because they were not expressed in the same units and therefore could not be aggregated. As a result, some of the more important measures may have been excluded.

## 4. Results and discussion

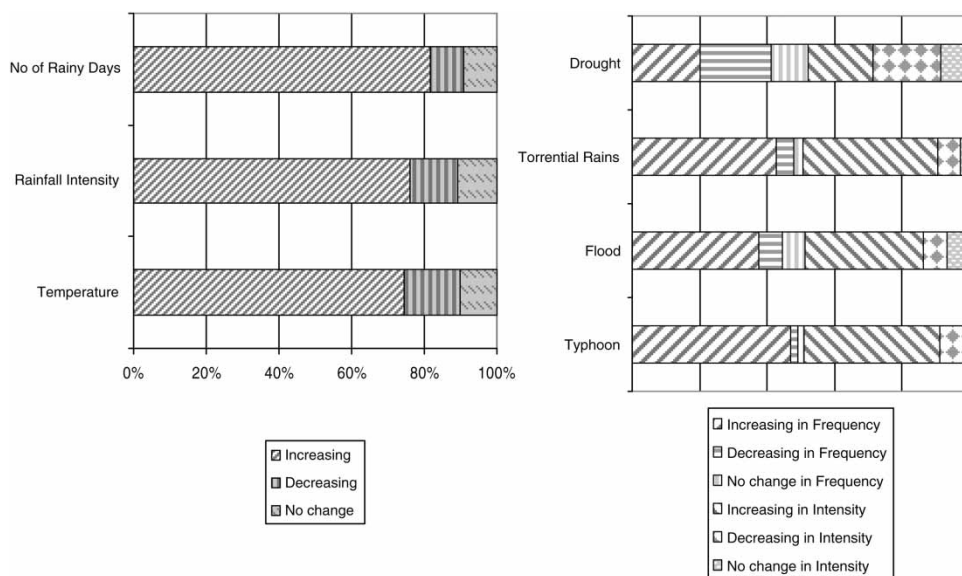
### 4.1. Perceived climate change and disaster risk vulnerability

Climate data from PAGASA show increasing trends in precipitation and temperature in Albay. According to the six villages studied in Bacacay, this is also the trend that they perceive. They have noticed increasing rainfall intensity and number of rainy days as well as increasing number of hot days. Similarly, they have perceived increasing occurrences of climate-related hazards such as typhoons and torrential rains (Figure 4). The seasonality of these hazards in the months of October to December causes stresses during these lean months. Generally, the main hazards identified in the mainland villages are typhoons, severe heat and floods while the island villages name typhoons, severe heat and storm surges as significant hazards. The shocks the communities have experienced in recent years were mostly related to the devastating impacts (especially on livelihoods) of very strong typhoons such as Typhoons Milenyo and Reming.

Ninety-seven per cent of the survey respondents said that they were not aware of the provincial programme on CCA. Most of them got information on climate change from television and radio and associated the changing weather they were experiencing to climate change because of its impacts on livelihood and health and the increasing hazards it brings.

Although the provincial government has taken significant steps to build awareness, there is a need





**FIGURE 4** Perceived changes in Bacacay. Left: climate trends. Right: climate-related hazards (average of six villages).

for wider dissemination of knowledge on climate change for communities to enhance adaptive capacity. The limited knowledge and awareness on climate change and disaster risk often impedes local action to address them. However, some of the respondents explained that awareness and possession of knowledge do not make it easier for them to cope since activities to secure livelihoods and achieve economic well-being always come first over activities to prepare themselves for the impacts of hazards and climate change.

#### 4.2. Structures and institutions

In Bacacay, coastal law enforcement remains a challenge in promoting sustainable livelihoods since illegal fishing continues to be practised and conflicts between commercial and municipal fishers persist, despite existing ordinances and laws on fishery. In addition, the municipal government and village council continually have to tackle problems on socio-economic and livelihood issues such as lack of technical skills, limited market access and lack of financial capacity of the local people.

Notwithstanding the management issues of the municipal government and village council, survey results show that the communities rely to a great extent on the municipal government and village council to address vulnerability reduction. Local actors who are at the forefront of climate change are key to achieving real impact on the ground (IFRC and ProVention Consortium, 2009). Not only do they possess local knowledge but also they can ensure sustainability of the adaptation practice. Hence, adaptation actions to address livelihood, disaster and climate change risks can be initiated by the municipal government or ideally by the community and other stakeholders with support from the village council and municipal government. However, the role of the provincial government should not be disregarded. It is in the best position to promote multi-agency and multi-sectoral coordination, especially since it has a programme on climate change in place.

#### 4.3. Local adaptation strategies

People in general rely on intuitive risk judgements for actions even when there is wisdom or error in

public attitudes and perceptions (Slovic, 2000). Communities in Bacacay have been experiencing the adverse impacts of climate change and have found their own indigenous and simple ways of coping with uncertainty and disasters and not waiting for external interventions (Table 4). To a

**TABLE 4** Summary of autonomous adaptation practices in Bacacay

Area of concern	Autonomous adaptation practice
Fisheries	<ul style="list-style-type: none"> <li>■ Longer time fishing in good weather</li> <li>■ Complementary income sources: <ul style="list-style-type: none"> <li>■ Farming</li> <li>■ Other fisheries-related employment (e.g. fish drying and fish vending)</li> <li>■ Small business operation</li> <li>■ Handicraft making</li> <li>■ Labour during harvest in farms and fishponds</li> <li>■ Non-agricultural labour (e.g. tricycle cab driving and construction work such as painting and carpentry)</li> </ul> </li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>■ Change in planting schedule and cropping patterns</li> <li>■ Diversification of crops planted – rice, corn, vegetables and root crops</li> </ul>
Food security	<ul style="list-style-type: none"> <li>■ Increasing household food stock</li> <li>■ Diversification of food sources (e.g. drying fish and gathering shellfish)</li> <li>■ Planting root crops and vegetables</li> </ul>
Extreme weather events	<ul style="list-style-type: none"> <li>■ Reinforcement of houses</li> <li>■ Reliance on traditional weather forecasting especially by fishermen</li> </ul>
Others	<ul style="list-style-type: none"> <li>■ Loans</li> <li>■ Sale of assets (e.g. household appliance, land and livestock)</li> <li>■ Outmigration</li> <li>■ Reduction in expenditures on food and basic necessities</li> <li>■ Change in attitude towards the environment</li> <li>■ Praying to God</li> </ul>

large extent, autonomous adaptation practices related to livelihoods are constrained to opportunities existing within the municipality, which are often an extension or variation of their present livelihoods. This demonstrates the limited access of people to alternative livelihoods and income opportunities. As a consequence, they have great difficulty in building their livelihood asset base and getting out of poverty. To help in enhancing livelihoods, some recommendations were given by survey respondents that can be considered in an adaptation strategy (Table 5).

#### 4.4. Analysis of livelihood assets

In Bacacay, the majority of survey respondents said that their livelihoods were the most impacted by climate change. Rural livelihoods are typically agriculture and fisheries based, where the majority of households live out of the natural resources of the area. Degrading forest and marine ecosystems, as is currently perceived, result in increasing vulnerability of households. Impacts on the main livelihoods in Bacacay, summarized from focus group discussions in Sogod, Bariw and Uson, are shown in Table 6. Common to all livelihoods are

**TABLE 5** Recommended measures for adaptation strategy

Category	Recommended adaptation measure
Human/technical	<ul style="list-style-type: none"> <li>■ Seminar/training on climate change, disaster management, alternative livelihoods and fishery laws</li> </ul>
Financial	<ul style="list-style-type: none"> <li>■ Access to credit to improve livelihoods</li> <li>■ Agriculture subsidies</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>■ Construction of evacuation centre and sea wall</li> <li>■ Improvement of roads, street lighting and irrigation system</li> </ul>
Others	<ul style="list-style-type: none"> <li>■ Increase in employment</li> <li>■ Enhancement of investment climate (especially for handicraft and tourism)</li> <li>■ Reforestation</li> <li>■ Mangrove rehabilitation</li> </ul>

**TABLE 6** Climate change impacts on livelihoods in Bacacay

Type of livelihood	Impact
Fisheries	■ Income loss: low fish catch/less fishing days
	■ Danger at sea/loss of life
	■ Sickness/injury
	■ Damage to fishing equipment
	■ Unemployment
	■ Household food insecurity
	■ Loss of savings
	■ Loans
Agriculture	■ Income loss: loss/damage to crops
	■ Reduced soil fertility
	■ Sick or weak livestock
	■ Household food insecurity
	■ Loss of savings
	■ Loans
Labour	■ Income loss
	■ Unemployment
	■ Loss of savings
	■ Household food insecurity
	■ Migration to urban centre to work
Handicraft making	■ Income loss: loss/damage to raw materials and finished products and difficulty in processing raw materials during wet season
	■ Unemployment
	■ Household food insecurity

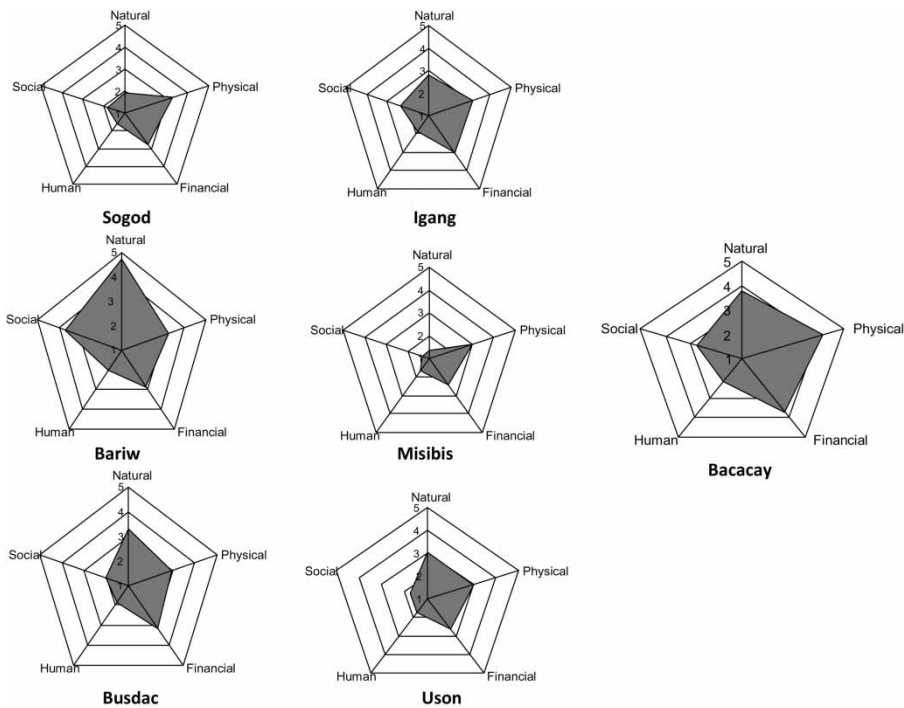
the impacts on income and food security, which are the main areas of concern of communities.

Livelihood assets are at the centre of the definition of livelihoods and household resilience. The greater and more varied the asset base, the more sustainable and secure the livelihood. These assets largely determine how people will respond to the impacts of climate change and can form the basis of adaptation strategies (IISD et al., 2003). Based on the livelihood asset pentagons constructed, a comparison of the six villages was carried out to determine the strengths and weaknesses of the villages' livelihood assets. Figure 5 shows the differing levels of livelihood

assets of each village and the municipality of Bacacay, as an average of the six villages studied.

The overall level of livelihood assets shows that natural, physical and financial assets are relatively strong in Bacacay. This can be explained by the rich ecosystems found in the municipality such as mangroves, forests, tidal flats and coral reefs; the level of physical assets present in the community including fairly good basic infrastructure and housing and livelihood implements ownership of households; and income and credit facilities existing in the municipality. Inactive local organizations, poor access to health services and unavailability of training account for weak social and human assets in Bacacay. It must be mentioned that although human interaction and social relations in most of the villages are not strong, they exist since Filipino communities are typically closely knit. For instance, the village leader of Busdac shares the fact that many residents call on her for advice on small matters such as family problems, money for transportation fare to go to the mainland and medicines for temporary relief. In the fishing village of Igang, many families share boats to engage in fishing.

Contrasting villages with highest and lowest scores, the elements that account for their strengths and weaknesses are explained in the following. Among the six villages, Bariw possesses the highest level of livelihood assets while Misibis shows the lowest. Bariw can be considered a representation of a village with high adaptive capacity whose attributes can be replicated in other villages in Bacacay. The important factors that account for its resilience are strong village leadership and solid community ties. The local governance practised in Bariw demonstrates that dedicated leaders can guide actions that can gradually enhance the community's socio-economic conditions, thereby building resilience. Since the village council is constrained by its budget allocation, alternative ways of helping the community are pursued through enhancing social capital. The close relationships among community residents form the basis for mutual and self-help, which allowed the formation of livelihood networks for instance. The trust and support they give one another becomes



**FIGURE 5** Left: level of livelihood assets in the six villages. Right: overall level of livelihood assets in Bacacay (average of six villages).

a powerful impetus for action. With the community working together even out of the little they possess, activities to sustainably maximize the use of natural assets and increase their physical and financial assets are undertaken. The example of Bariw shows that the community can accomplish a lot together on their own and even more when supported by local leadership.

On the other hand, Misibis shows the lowest level of livelihood assets among the villages, of which natural and social assets are weakest. Existing conditions, particularly the development of a prime resort-estate, account for its low scores. According to respondents, this resort development is not favourable to livelihoods in the community because of the environmental destruction it has wrought. Many lands have been converted, especially farmlands (which farmers have been forced to sell). Moreover, fishing grounds have been claimed by the resort development so that fishermen have to fish in areas far from the village. Clearly, farmers and fishermen no longer

benefit from the natural resources in the village. In terms of social relations within the village, these are poor because the community is divided into those that favour the resort development because of the employment it brings and those that are against it. Furthermore, relationships are somewhat strained because many migrants moved to the village in order to work at the resort. Local leadership is poor in terms of livelihood improvement and vulnerability reduction.

The situation in Misibis dictates the consideration of alternative measures to improve the resilience of the community. Since there is little support from the village council in addressing its various vulnerabilities, residents must endeavour to strengthen their relationships with one another and develop a connection that is socially and economically valuable. The fact that people in the community have weathered regular stresses and shocks in both climate and economy on their own indicates that building social capital can be advantageous for everyone.

**TABLE 7** Recommendations and actions to reduce climate change and disaster risk vulnerability and enhance human and social assets in Bacacay

Recommendation	Specific action
Increasing awareness on CCA, DRR and environmental stewardship at village level	<ul style="list-style-type: none"><li>■ CIRCA and APSEMO to scale up information, education and communication (IEC) on climate change and DRR to address the gaps in knowledge and information sharing at the village level</li><li>■ Provide environmental education especially on coastal resources management at village level</li></ul>
Building the capacity of municipal and village government officials	<ul style="list-style-type: none"><li>■ Provide IEC and training of municipal and village-level government officials on climate change, DRR and coastal resources management</li></ul>
Promoting and increasing multi-stakeholder participation	<ul style="list-style-type: none"><li>■ The municipality should develop ties with the academe especially Bicol University, a centre of excellence on fisheries; NGOs operating in the province and the private sector to encourage collaboration and support in terms of research, funding and facilities</li></ul>
Promoting income diversification	<ul style="list-style-type: none"><li>■ Enterprise development should be promoted and alternative livelihoods in non-climate-sensitive sectors explored especially in the lean months of October to December</li><li>■ The municipality must achieve standards of excellence in <i>karagumoy</i> and <i>abaca</i> handicraft-making to make them competitive and allow markets to open</li></ul>

Source: Summarized from findings of questionnaire surveys, key information interviews and focus group discussions.

Given the analyses of livelihood assets as depicted in the pentagons, there is, therefore, a need to develop strategies to improve human and social assets in Bacacay in order to support resilience building. Table 7 presents some recommendations and specific actions to reduce climate change and disaster risk vulnerability and enhance human and social assets in Bacacay. In addition, the understanding of micro-level conditions and unique contexts of the village will allow for the consideration of approaches to enhance the adaptive capacity of each village. Adaptive capacity is crucial in learning to live with change and uncertainty because it is related to resilience in terms of its support in the ability to cope and recover (Ensor and Berger, 2009).

5. Conclusion

Adaptation can be interpreted as responses that help improve the resilience of livelihoods (Rojas

Blanco, 2006). Adaptation strategies primarily aim to address not only the reduction of vulnerability to climate change but also the sustainability and improvement of livelihoods. Local adaptation must be informed of how people, especially the poor and vulnerable, sustain their livelihoods and what the role of natural resources and external services is in livelihood activities. Strategies to strengthen the resilience of communities, and especially poor communities, should be based on the most effective combination of measures to secure and enhance the community's asset base and measures to provide improved services (IISD et al., 2003). Thus, local adaptation strategies geared towards livelihood resilience-building are crucial since they will significantly affect the community's ability to deal with the impacts of climate change.

Looking at livelihoods from an SLA lens as done in this study was effective as a means of assessing adaptation capacity because it was able to (i) reveal local vulnerabilities, (ii) build an

understanding of macro- and micro-level enabling conditions for adaptation, and (iii) identify locally relevant resilience-building options (Spanger-Siegfried et al., 2005). The study articulates the vulnerability of human and social assets, thus establishing the fundamental need of enhancing human and social capital in Bacacay as a prerequisite to building livelihood resilience in its coastal communities. A soft approach targeting human and capital enhancement will increase the resilience level of the municipality, thereby enabling a sustainable livelihood system for people to pursue robust livelihood strategies. The case study of Bacacay demonstrates that analysis of livelihood assets provides an understanding of the important factors in livelihood dynamics.

The comparison of the six villages reveals that micro-level variations among the villages are significant such that they become indispensable in framing appropriate local adaptation strategies. Specific action plans considering the observed variations can strengthen weaknesses and build on the strengths of livelihood assets in each village. Taking into account individual characteristics, adaptation strategies can also be developed focusing on the strong livelihood assets of the village in order to capitalize on them. For instance, Bariw can build up its knowledge and market network with less difficulty because of its strong capital – the organizations in the village provide a good opportunity to access information and markets. Formulation of adaptation strategies in this way allows for a unique approach in every village that is the best fit for the community.

Although national strategies are critical in framing the overall and general strategy on adaptation for the country, the manner of implementation of this strategy at the local level requires a specific approach, one that takes into account the local condition. Local government institutions, particularly the municipal government, play a key role in promoting an enabling environment for local adaptation. They are in a position to understand local conditions better and know the best way to deal with them. Adaptation

actions of the municipal government, which take into account differences among villages, can better address climate and disaster risk issues.

The emphasis on local adaptation in this study is an attempt to show that micro-level studies on adaptation are important. The understanding of the unique context at this level allows for sound adaptation planning. Appropriate adaptation at the micro-level is most beneficial to people because they are the ones directly affected by climate events. In addition, the fact that most of them are poor and require enhanced adaptive capacity necessitates their prioritization in adaptation activities. Similarly, the focus on livelihood resilience attempts to illuminate micro-level livelihood realities and highlight the importance of building the resilience of livelihood systems. Livelihood resilience is key to the ability of coastal communities to face challenges, especially a challenge as great as what climate change presents.

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