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How does climate exacerbate root causes of conflict in the Philippines?

Climate Security Pathway Analysis

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This factsheet gives answers on how climate exacerbates root causes of conflict in the Phillipines, using a pathway analysis. Two main pathways are identified:

1. Resource Availability and Access: Climate change and variability impact water and land systems, contributing to an increase in competition over the access and distribution of natural resources. In the Philippines, disputes over the access and use of limited land and water resources can interplay and contribute to creating or exacerbating already existing conflict dynamics and encouraging civilians to participate in illegal activities.

2. Livelihood and Food Insecurity: Climate variability and extremes, especially rapid-onset events, amplify socioeconomic vulnerabilities, leading to heightened livelihood and food insecurity. This, in turn, elevates the risk of recruitment into non-state armed groups and involvement in illegal activities. The ramifications of livelihood and food insecurity are anticipated to spur migration towards urban centres, either within the country or abroad, further exacerbating tensions in the receiving communities.

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1. **How does climate exacerbate root causes of conflict?**
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Questions 1, 2, 3, 5 are analyzed at country level through a Climate Risk Lens (impact pathways, economic, spatial, network and social media analyses). The policy coherence and scopus analyses are at continental level.

*Scopus is one of the largest curated abstract and citation databases, with a wide global and regional coverage of scientific journals, conference proceedings, and books. We used Scopus data for analyzing: (1) how global climate research addresses the dynamics between climate, socio-economic factors, and conflict, and (2) how the countries studied are represented in the database.

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1. CONTEXT

Climate profile

The Republic of the Philippines, encompassing 7,107 islands, stands as a focal point for climate change, characterized by elevated vulnerability and constrained adaptive resources. Recognized as among the world's most biologically rich and diverse nations, the Philippines confronts substantial ecological threats, ranking among the countries most susceptible to the adverse effects of natural hazards and climate change (Giles et al., 2019; IEP, 2022; WBG 2021).

The Philippines is characterized by a humid equatorial climate with high temperatures (averaging 27°C throughout the year), heavy rainfall (mainly influenced by the southwest and northeast monsoon) and strong periodic droughts and heatwaves linked to the El Niño Southern Oscillation (WBG, 2021). Rainfall is spatially and seasonally variable, evidencing a wet season from May to October and a dry season from November to April (PAGSA, 2018; UNFCCC, 2014). The country is particularly exposed to tropical cyclones, flooding, and landslides. The highest number of typhoons occur in Luzon, particularly in the Cagayan Valley, Ilocos Region, Central Luzon, Cordillera Administrative Region, and the Bicol Region (Israel and Briones, 2013). Between 1951 and 2010, a discernible decrease in annual total rainfall has been noted in Luzon, Palawan, and the western segments of Visayas, along with the central and western areas of Mindanao. Conversely, an observed increase in rainfall ranging from 10mm/decade to as much as 40mm/decade has been documented in the central parts of Luzon, the eastern section of Visayas, and the north-eastern portions of Mindanao during the same period (PAGSA, 2018).

The Philippines is anticipated to experience an escalation in average surface temperatures, projected to range from 0.9 to 1.9 degrees Celsius by 2050 (PAGSA, 2018). Notably, the projections for rainfall exhibit substantial variability contingent upon the chosen climate scenario. Under the RCP 4.5 scenario, the overall rainfall in the Philippines is expected to align with natural variability, with the exception of the central sections of Mindanao. This region is anticipated to undergo increased aridity, particularly during the September to February season (PAGSA, 2018).

Climate change is poised to bring about a reduction in the frequency of tropical cyclones while accentuating their intensity and the already pronounced seasonal fluctuations (Pulhin et al., 2016; PAGSA, 2018). Furthermore, sea level projections indicate an approximate increase of 20 cm by 2050, exacerbating storm surge hazards, especially in coastal communities (PAGSA, 2018). The anticipated consequences include the expansion of floods into new areas and an intensification of flooding in existing flood-prone regions (WBG, 2021).

Conflict and fragility

Since gaining independence in 1946, The Philippines has witnessed a protracted history of subnational and local conflicts, particularly pronounced in Mindanao and Southern Philippines. These conflicts involve various groups, including communist insurgency factions like the Filipino Communist Party, Communist Party of the Philippines, and the National People's Army. Additionally, Muslim separatist organizations such as the Moro National Liberation Front, the Moro Islamic Liberation Front (MILF), Abu Sayyaf Group, and Bangsamoro Islamic Freedom Movement have been key actors. The nation has also grappled with military coup attempts in the late 1980s and a 20-year dictatorship marked by martial law

and human rights abuses (Capuno, 2019; UCDP, 2022). Deeply rooted in ethnoreligious divisions which perpetuate social tensions, competition over land and auto-proclaimed goals for self-determination and autonomy are the roots of the persistent conflict in Mindanao (Bolton & Leguro, 2015). Recently, state-based violence, linked to the War on Drugs, has substantially increased, including extrajudicial killings, currently being investigated by the International Criminal Court (UCDP, 2022; ICC, 2021).

While violence continues to be particularly prominent between the government and different armed groups, including the communist New People's Army and Islamic State-affiliated groups, the government has started a peace process in the Southern region (The Asia Foundation, 2017; ICG, 2022). Negotiations between the MILF and the Philippine government for ending the Moro Muslim separatist struggle culminated in early 2019 with the creation of the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) (ICG, 2022). Nevertheless, while militancy in Muslim Mindanao has faded during the transition government, some municipalities still continue to experience episodic violence (ICG, 2022).

In addition to the challenges presented by insurgent groups across Mindanao, the Muslim communities in the region have contended with an enduring threat in the form of local violence, prominently exemplified by inter-clan feuds commonly known as "Rido." These feuds, often involving influential clans, have imparted profound and wide-ranging repercussions on the local populace. They impede mobility, hinder access to essential public services, discourage investment in the region, and, notably, permeate the formal policy system through municipal governance structures. These conflicts typically stem from disputes over land ownership, political authority, and issues pertaining to clan honor and pride (Medina et al., 2024).

In the past decade, the escalation of land-based conflict and extremist violence in the region has coincided with a surge in urban violence linked to what is commonly referred to as "shadow economies." These shadow economies encompass a spectrum of activities, including informal credit provision and cross-border commerce (International Alert, 2014). However, they also extend to illicit practices such as smuggling, gun trafficking, illegal gambling, narcotics production, and unregulated land transfers (Vellema et al., 2011).

Various actors participate in the informal economy, ranging from entrepreneurs seeking wealth and influence to ordinary individuals and communities relying on it for their daily sustenance. Notably, local governmental figures are at times involved in these unofficial or even illicit economic activities. This involvement provides local elites with a financial underpinning to advance their political ambitions. For instance, funds derived from narcotics activities are often directed towards political campaigns or utilized to enhance the influence of armed rebel groups and powerful clans in securing political positions (International Alert, 2014).

Socioeconomic context

Natural resources play an important role in the Philippines' economy. While agriculture, forestry and fishing account for 10.1 per cent of the total GDP, primary production of agriculture provides employment for 32 per cent of the total population of the country, 74 per cent of whom are men (Dikitatan et al., 2017; World Bank, 2021). Agriculture remains the main source of income for poor

rural people and the only source for those who are in the poorest households (Dikitatan et al., 2017; IFAD, 2016; Lasco et al., 2016). 56 per cent of the total population lives in rural areas, most of them being highly dependent on subsistence farming and fishing for their livelihoods (Dikitatan et al., 2017; IFAD, 2016). Combined with a lack of infrastructure, political and institutional barriers, small-scale and fragmented agriculture have led the agricultural sector underdeveloped and unable to meet the food requirements of a growing population (Dikitatan et al., 2017).

The Philippines is characterized by an unequal land tenure system, with 70 per cent of the farmer workers being landless (USAID, 2011). While the majority of land ownership is held by men, women possess joint decision-making power over land utilization (Akter et al., 2017). Considering that 60 per cent of The Philippines population lives in coastal areas, a big section of the country's economic sectors as well as populations are highly dependent on natural resources and local ecosystems for food and income generation (IOM, 2021; WBG, 2021). The fishing industry provides employment to about 1.6 million people, and its products contribute significantly to protein intake in Filipino diets (IUCN, 2020).

Highly dependent on food imports, particularly of wheat and rice, which are the main staple crops for the population, and fish, the Philippines is vulnerable to the impact of climate change and natural hazards (CIAT & WFP 2021; Dikitatan et al., 2017). The agricultural sector encounters challenges stemming from a growing population with evolving dietary preferences, compounded by inadequate market access and information services, limited investments in agricultural research, and an aging farm labor force (Dikitanan et al., 2017).

In general, despite relatively low unemployment rates at 2.54 percent, a significant portion of the population, accounting for 16.8 percent, grapples with poverty, and a substantial 43.8 percent faces moderate or severe food insecurity (World Bank 2020; 2021). This food insecurity is further delineated with 39 percent experiencing mild chronic food insecurity, 17 percent confronting moderate levels, and eight percent contending with severe and persistent food insecurity (Integrated Food Security Phase Classification, 2015). Child malnutrition is also a key issue, with 28.7 per cent of children under five years of age being stunted (FAO et al., 2022). While the Philippines is a net food importer of rice, in the last twenty years, there has been a substantial increase in food exportation (FAOSTAT, 2020), consequently creating a dependency on external markets and, therefore, increasing the Philippines' vulnerability to external supply chain disruptions, such as the war in Ukraine.

2. CLIMATE SECURITY PATHWAYS

The repercussions of climate change are poised to exacerbate crop losses and diminish marine captures, thereby escalating livelihood and food insecurity. Concurrently, these climatic shifts are expected to intensify pre-existing local tensions concerning the availability and accessibility of crucial resources. The adverse effects of climate variability and extreme weather events on income-generating activities are lowering the opportunity costs associated with joining armed groups. This, in turn, is amplifying the violence perpetrated by armed groups against civilians and heightening social unrest.

Furthermore, climate impacts are contributing to both internal and external human mobility. This encompasses internal displacement linked to extreme weather events and rural-urban migration to major urban centres such as Manila and San Jose. Without the implementation of climate adaptation measures, the Philippines is projected to incur an annual loss of up to six percent of its GDP by the year 2100. (Asian Development Bank, 2009).

In this section, we explore the impacts of climate variability and extremes through two pathways: (i) resource availability and access and (ii) livelihood and food insecurity.

PATHWAY #1: Resource availability and access

Climate change and variability impact water and land systems, contributing to an increase in competition over the access and distribution of natural resources. In the Philippines, disputes over the access and use of limited land and water resources can interplay and contribute to creating or exacerbating already existing conflict dynamics and encouraging civilians to participate in illegal activities.

Predicted sea level rise not only presents a threat to coastal cities but as well leads to saltwater intrusion of coastal ecosystems, consequently affecting freshwater availability (Ewing, 2009). Increased ocean temperatures can not only lead to more frequency of flooding in low-lying areas, greater coastal wetland and mangrove degradation but also impact coral bleaching, decline fish stocks and affect plant cycles and fish breeding patterns (Ewing, 2009). These changes have already been reported to be impacting marine capture fisheries, aggravating pre-existing challenges in the sector that constitutes an important economic activity in the coasts (Suh and Pomeroy, 2020). Indeed, inland waters capture production in the Philippines has declined from 0.26 to 0.15 million tonnes from the 1980s to 2020 (FAO, 2022). These figures are mainly attributed to the lack of effective fish cash restrictions and management and the continuously growing fishing captures despite the overexploitation of the resources (Anticamara and Go, 2016).

The implementation of zoning regulations, such as marine protected areas, limiting the sector's overexploitation of resources, have increased the tensions and conflicts over the remaining marine resources in the Visayan Sea (Pomeroy et al., 2016; Siason et al., 2004). Combined with the increased availability and reduced cost of small arms and munitions in the Philippines, competition between commercial and municipal fishers has increased armed fishing operations and intensified civil unrest (Pomeroy et al., 2016). Increased competition and conflict driven by overfishing have been found to be linked with illegal trafficking of goods (such as narcotics or small arms), people (e.g. forced labour) and piracy (for instance, at-sea robberies, kidnapping, oil theft and transfer) (Pomeroy et al., 2016).

The effects of climate change are also aggravating existing tensions with upstream and downstream residents around the access to reduced water resources due to overlapping water demand and poor benefit-sharing practices (Piñon et al., 2012). Elevated temperatures, coupled with a rising frequency of droughts and severe weather events, are presently exerting pressure on water resources. This strain is manifested through a reduction in both the quantity and quality of available water supplies across the Philippines, with a noteworthy impact on coastal municipalities in Luzon, Visayas, and Mindanao

(USAID, 2017). Current figures indicate that 1 in 10 people do not have access to improved water sources and that by 2040, the Philippines is predicted to increase these figures and experience a high degree of water shortage (World Resources Institute, 2015; WHO, 2019). In regions where rainfall is projected to decrease, water stress is expected to cascade into more adverse impacts, particularly on livelihoods, agriculture, forestry, health and human settlements (PAGASA, 2022). Climate projections expect an increase in the peak river runoff in the northern region of the country (I.e., Luzon) as well as in the river discharge in Visayas and Mindanao (Louise Tolentino et al., 2016). While more recurrent rainfalls are expected to aggravate water-induced soil erosion in highland areas, low-lying areas are projected to be further increased due to flood risks (Louise Tolentino et al., 2016).

Increasing water scarcity is expected to exacerbate existing conflicts during dry periods in the region of Mindanao (Piñon et al., 2012). This is due to the conflicting laws of the current institutional national regulatory framework nature, as while it prioritizes water for domestic use during periods of drought, it also stipulates that the state owns all water in the country, protecting indigenous peoples' resources in their ancestral domain (Rola et al., 2015). In the Bukidnon province, for instance, water scarcity has been a source of conflict during drier periods due to overlapping management regimes between the Talaandings indigenous group and the Lantapan government and private companies (Piñon et al., 2012).

VOICES FROM THE FIELD - Fishery conflict in Agusan Marsh, Agusan del Sur

The establishment of the Agusan Marsh Wildlife Sanctuary marked a significant turning point for conservation and sustainable resource management efforts in Mindanao. It brought about a notable shift in the mindset of local communities, fostering a greater commitment to environmental preservation. Central to these transformative changes is the Bantay Danao (River Rangers) program, a community-driven initiative implemented in collaboration with governmental bodies and local residents. This community-based conservation effort hinges on the active participation of residents, particularly voluntary fishermen and farmers from the Manobo community, some of whom had been violators of fishing regulations.

While the Bantay Danao program has made significant strides in monitoring and enforcing fishing regulations within the Agusan Marsh, it faces inherent limitations. The vast expanse of the marsh makes it impossible for program volunteers to maintain constant surveillance over the entire area. This limitation is compounded by the challenging and sometimes hostile conditions in which they operate. Illegal fishing activities, often involving individuals who are armed and determined to evade capture, pose a considerable threat to Bantay Danao volunteers. When these volunteers identify instances of illegal fishing, they have limited authority to directly enforce the ban. In practice, the role of Bantay Danao is primarily to report such violations to the police or relevant authorities. This highlights the importance of collaboration between the program and law enforcement agencies (Medina et al., 2024).

Combined with rural-urban migration and rapid urbanization of major cities, climate change is expected to continue compounding water supply demand problems in urban areas (Mason, 2012). In several Baguio City neighbourhoods, such as Dominican Hills or Irisan, households rely on the private delivery of water during the year and rainwater in the rainy season (Mason, 2012). During the dry season, as rainwater can no longer be used, households are in need of more income to meet the demands of private water purchases (Mason, 2012). Local leaders have indicated increasing migration towards and within Baguio City as well as Dominican Hill, contributing to local conflicts between the new residents and the more established ones (Mason, 2012).

Resource availability and access in Mindanao

In the southern part of the Philippines, the provinces of the Bangsamoro Autonomous Region of Muslim Mindanao (BARMM) are experiencing compound risks arising from both climate change and violent conflict (Ewing, 2009). Indeed, some of the most conflict-prone provinces in the region have the highest ecological risk indicators in the Philippines (Ewing, 2009). Being the second largest island in the Philippines and representing a quarter of the country's population, a third of Mindanao's land area is devoted to agriculture, an activity employing 23 per cent of the population (FAO, n.d; WB, 2019).

Mindanao is identified as a drought-prone region as recently evinced during the intense drought period of 2015-2016 associated with el Niño that affected an estimated 224,834 ha of agricultural land (IFCR, 2016). Even though Mindanao's GDP growth has substantially increased in recent years and surpassed that of other regions and the national average, Mindanao's share of the country's GDP still is at 14.4 per cent (FAO, n.d.). Compared to other regions' contributions, such as Luzon's (74 per cent), Mindanao's contribution is substantially lower, reflecting uneven agricultural development and big social disparities between the various regions in the Philippines (FAO, n.d.). Disputes between individuals and families due to land tenure and access to natural resources are among the most common underlying causes of violent conflict in Mindanao (Bolton and Leguro, 2015; Ewing, 2009).

Mindanao's population is largely characterized by inadequate access to freshwater resources, having the lowest coverage of safe drinking water and sanitation facilities coverage nationwide (UNICEF, 2017; Spangler, 2017). The lack of regulation and poor governance have led to degraded water quality, exhausted water sources due to overuse as well as insufficient infrastructure, particularly in areas experiencing conflict (Spangler, 2017). Disputes over water rights have been identified to arise where governing institutions do not have a strong presence (Spangler, 2017).

In upper Manupali (Latapan municipality, Bukidnon province), water scarcity has been a source of conflict during drier periods due to overlapping management regimes between the Talaandings indigenous group and other major water users such as Lantapan government, banana companies and the Department of Environment and Natural Resources (Piñon et al., 2012). Depriving parties of water access by stealing, cutting irrigation pipes or destroying small impounding reservoirs has been used as a tactic in the conflict (Spangler, 2017; Piñon et al., 2012; USAID 2014). Combined with environmental degradation, climate-induced natural disasters threaten infrastructure systems and watersheds in Mindanao, impacting food and water security and, consequently, amplifying vulnerabilities (Delina & Cagoco-Guiam, 2018).

While much of the widespread violence has its roots in a long history of ethnic, religious, and political tensions, it was ultimately land tenure disputes that helped drive part of the Philippines' Muslim population to pursue secession (Spangler, 2017; ICG, 2012). As climate change impacts intensify and perceptions around inequality and injustice between the Muslim and the Christian population widens, efforts to address issues around the competition over land in Mindanao are expected to become even more challenging (Ewing, 2009).

VOICES FROM THE FIELD - Unclear and overlapping resource-tenure mechanisms increase the risk of conflict over natural resources

The impacts of climate threats described above are highly mediated by resource management systems across Mindanao. Since 2010, government entities in Mindanao, including the Mindanao Development Authority (MINDA) and the Department of Environment and Natural Resources (DENR), have been advocating for the implementation of a more cohesive ecosystem-based management system. This system aims to involve various stakeholders, including Local Government Units (LGUs) and the Armed Forces of the Philippines (AFP), in the efficient management of conflicts related to natural resources. While there have been notable advancements in promoting ecosystem-based governance, a significant challenge lies in the presence of numerous, and sometimes conflicting, policy mechanisms used to determine resource tenure and access. These conflicting policies are believed to be a potential trigger for resource-related conflicts in the region.

Many government agencies recognize the need for a unifying law to address these overlapping provisions and bring clarity to land management. To elucidate, land tenure mechanisms include the Community Based Forest Management Agreement (CBFMA), the Certificate of Stewardship Contract (CSC), the Timber License Agreement (TLA), the Industrial Forest Management Agreement (IFMA), the Socialized Industrial Forest Management Agreement (SIFMA), and the Certificate of Ancestral Domain Title (CADT), the latter of which is designated for Indigenous Peoples. Over time, the diversity of tenurial instruments and their widespread application has led to issues of overlapping and inconsistent land classification (Medina et al., 2024).

Resource availability and access in the Visayan and South China Sea

Situated in the central Philippines, the Visayan Sea has become a focal point for conflicts revolving around water resources, involving both commercial and municipal fisher stakeholders. The root of these conflicts lies in the national fisheries policy, specifically the 1998 Fisheries Code, which restricted large-scale fleets from fishing within 15 km of the shoreline (Salayo et al., 2006). Notable conflicts have emerged, such as those in Concepcion (Iloilo), where disputes between commercial fishers, Bantay Dagat, and local government officials have arisen over the implementation of zoning regulations (Siason et al., 2004). In recent years, tensions over competing claims in the regional waters of the South China Sea have intensified, with an increasing prevalence of "ocean grabbing" practices (de Coning et al., 2022).

The impact of climate change, including elevated sea temperatures and subsequent ocean acidification, has adversely affected water resources in the Visayan Sea, placing significant stress on marine ecosystems (Salayo et al., 2006; Sumalia et al., 2021). This phenomenon is closely tied to overexploitation, illegal fishing, and habitat destruction in the fishery sector. Changes in water temperatures and oceanic currents, driven by climate-induced shifts, have further exacerbated the decline in fish stocks, impacting their productivity and migratory patterns toward higher and cooler latitudes (Anticamara and Go, 2016; Siason et al., 2004; Suh and Pomeroy, 2020). Even a slight increase in temperature can significantly affect the mortality and reproductive rates of marine organisms, potentially leading to the disappearance of species traditionally vital to commercial markets and seafood supply (Sumalia et al., 2021). Simultaneously, the ocean's absorption of carbon dioxide has resulted in ocean acidification, compromising the quality of many invertebrates with calcium carbonate shells and exteriors, thereby posing a threat to their survival (Sumalia et al., 2021).

The reduction in the availability and access to fish resources has also driven traditional fishermen to engage in illegal fishing and illicit activities, including stealing cash, fish and valuables (Pomeroy et al., 2016). Some fishing fleets have also entered territorial waters from neighbouring countries or disputed by two or more states, leading to the interception and destruction of foreign vessels and the subsequent increase in diplomatic tensions in the region (de Coning et al., 2022). For instance, Vietnam and the Philippines argue that Chinese military operations in the South China Sea have evicted up to 1.100 fishing boats from the northern South China Sea (Fleishman, 2021). Projected increases in ocean acidification and water temperatures in the South China Sea could further exacerbate the depletion of fish stocks, further undermine the access to municipal fisheries and increase the likelihood intensifying tensions between different users in Philippines as well as with neighbouring countries over the access to fish stocks (Siason et al., 2004).

PATHWAY #2: Livelihood and food insecurity

Climate variability and extremes, especially rapid-onset events, amplify socioeconomic vulnerabilities, leading to heightened livelihood and food insecurity. This, in turn, elevates the risk of recruitment into non-state armed groups and involvement in illegal activities. The ramifications of livelihood and food insecurity are anticipated to spur migration towards urban centres, either within the country or abroad, further exacerbating tensions in the receiving communities.

More than half of the population in the Philippines lives in rural areas (Dikitanan et al., 2017). The agricultural sector employs 23 per cent of the total population and is the primary source of income for poor rural people (IFAD, 2016). As a result of climate change, increased water and heat stress will reduce crop yields, rise incidence of pests and diseases as well as cause shifts in crop production suitability (Dikitanan et al., 2017). While climate change effects are expected to impact the overall population, those whose primary occupation is agriculture and fishing will be particularly impacted during the dry season, when water is scarce, due to high dependence on natural resources (UNFCCC, 2014). Climate variability and extreme weather events, including more frequent and intense natural hazards, are expected to have destructive socio-economic effects, disproportionately affecting coastal populations, urban poor, agricultural and rural communities, with particular emphasis on subsistence farmers, women, and children (CIAT and WFP, 2021; Climate Change Commission, 2018; Chandra et al., 2017; Cruz et al., 2018; WBG, 2021). Women, traditionally employed in the rice production

sector, are obliged to pursue off-farm employment, often as domestic help and bear double burden of work (Bordey et al., 2013; Chandra et al., 2017). In this context, water buffalo has been identified as an adaptation strategy and alternative income source due to their multiple functions for both household and farming needs (Escarcha et al., 2020).

More exposure to natural hazards is directly linked with low economic resources and the consequent lack of local water storage, irrigation infrastructure and technologies for adaptation (WBG, 2021). Climate-induced extreme events and rainfall shocks damage infrastructures, decline agricultural productivity and produces losses in livestock farming (Crost et al., 2018; Escarcha et al., 2020; Israel and Briones, 2013; Gatto et al., 2021). Therefore, in the Philippines, climate change impacts crop productivity and food security, through two different mechanisms: (i) production of staple crops and (ii) infrastructure and market disruptions that impede access to required inputs or prohibit effective postharvest processing or storage (CIAT and WFP, 2021; Giles et al., 2019).

While variable rainfall is expected to provide less favourable conditions for certain crops, the new conditions may increase the suitability of other crops in certain parts of the country, such as Uplands areas (CIAT and WFP, 2021). Studies on the impact of climate change on future grain production suggest an overall alteration in production of key staple crops, such as corn and rice (Bordey et al., 2013; CIAT & WFP, 2021; Crost et al., 2018; Pulhin et al., 2016; Lassa et al., 2018; Salvacion, 2017; Israel and Briones, 2013). Rice is the most important crop in the Philippines, representing 33 per cent of the total harvested area and 56 per cent of the caloric intake (Dikitanan et al., 2017; Palalog et al., 2019). Due to its high sensibility to changing weather patterns, irrigated and rainfed rice are expected to be negatively impacted in the northern provinces of Pangasinan and Nueva Ecija (Bohra-Mishra et al., 2016; CIAT & WFP, 2021). While some climate projections predict environments that are more conducive to rice production in Luzon, others indicate the detrimental effects increasing temperatures could have on the dry-prone region of the inland pockets in Mindanao (CIAT & WFP, 2021). While predictions indicate that each 1°C increase in the summer temperature decreases the total rice yield by 6 per cent, estimates show that rice yields will decline by 3.2 per cent by 2050 (Bohra-Mishra et al., 2016; Dikitanan et al., 2017). An increase in the share of wet days is negatively correlated with average gross income per hectare/farm income (Borey et al., 2013). On the contrary, estimates predict a reduction by 14.6 per cent of maize's climatic suitability and production, particularly in the Isabela province by 2050 (Crost et al., 2018; Dikitanan et al., 2017; Salvacion, 2017).

Climate-induced extreme events are expected to continue declining agricultural productivity (Israel and Briones, 2013; Gatto et al., 2021). From 2000 to 2010, agricultural damage from extreme weather events, such as typhoons and floods, has been estimated to correspond to a total loss of USD 2,234.21 million (Israel and Briones, 2013). Research on the super-typhoon Ompong's effects on agricultural incomes revealed a 42 per cent income decline due to yield loss (Gatto et al., 2021). As a consequence of climate change, forecasts project an estimated decline in agricultural land productivity ranging from 9 to 21 per cent and up to 85 per cent in lands to be impacted by typhoons, droughts and floodings by 2050 (Bohra-Mishra et al., 2016; Puhlin & Tapia, 2016). Similarly, climate-induced increases in ocean temperatures, combined with erratic and unpredictable monsoon seasons lengths, are expected to continue exacerbating the already existing depletion of fish stocks trend (Anticamara & Go, 2016; Siason et al., 2004; Suh & Pomeroy, 2020). Declines in fish production are expected to lead to a decline in wage rates of 3.62 per cent and a 1.19 per cent increase in consumer prices (Nong, 2019).

Displacement associated with natural disasters has increased over time, with 5,681,000 Internally Displaced Persons in 2021 (WBG, 2021). Estimates indicate 60 per cent of the Philippines' territory and 70 per cent of its population are exposed to natural hazards, including cyclones, droughts, earthquakes, floods, landslides and tsunamis (WBG, 2021). Only in 2020, The Philippines recorded 4.4 million disaster displacements (IOM, 2022). Since 1990, natural disasters have had damage equivalent to 23 billion dollars as well as contributed to the loss of 70.000 lives (WBG, 2021). Similarly, only in General Santos City in Mindanao, El Niño Southern Oscillation drought caused food shortages to 804.054, or 3.6 million people in seventeen cities and provinces (Warren, 2013).

One of the most widespread direct risks from climate change impacts is its impact on human settlements, particularly on the families living in coastal and river areas (Virola et al., 2018: IOM, 2021). Combined with socioeconomic factors, climate-induced loss of livelihoods is a key driver of internal migration (Bordey et al., 2013; Ebay, 2017; IOM, 2022). Increasing temperatures have a significant positive effect on outmigration, particularly on men, and more educated and younger populations (Bordey et al., 2013; Bohra-Mishra et al., 2017). While men are more likely to migrate to low-disaster-risk areas so as to seek employment, women's conception as caregivers of children, sick and elderly contributes to staying home in high-risk disaster areas (Fatouros et al., 2021). For each 1 °C increase in the summer temperature, migration increases by 0.6 per cent (Bohra-Mishra et al., 2017). Rapid on-set events, such as typhoon activity, have a higher impact on male and female migration, with 0.16 and 0.1 per cent increases respectively (Bohra-Mishra et al., 2017). Changes in rice yield and gross revenue per hectare linked to slow and rapid onset events significantly drive inter-provincial and overseas migration, particularly in provinces with a higher share of the rural populations (Bordey et al., 2013; Bohra-Mishra et al., 2017).

Migration is seen as an adaptation strategy and coping mechanism to diversify sources of livelihood (Bordey et al., 2013). While wealthier farming households opt for overseas migration, including the United States, Canada and neighbouring Malaysia, so as to obtain higher incomes and be able to send higher remittances, poorer ones send family members to other regions within the country (Bordey et al., 2013; IOM, 2022). Nevertheless, proactive climate-related displacement does not often happen, as poor households often lack the economic means to adapt or migrate (Tadgell et al., 2017). Rapid-onset events are positively correlated with poverty and hunger, significantly impacting poor populations' standard of living to the extent that those who have been impacted by natural hazards are led to poverty traps, not able to recover from the events easily and, consequently, deepening inequalities in access to basic services and resources (Asian Development Bank, 2009; Balisacan et al., 2001; Balisacan and Pernia, 2002; Porio, 2016). Similarly, landlocked, isolated, with high transport cost areas, which have a high frequency of natural disasters or typhoons, are correlated with poverty (Baslisacan et al., 2001).

Informal settlement proliferation, linked to rural-urban migration, has increased the number of residents lacking access to basic services as well as experiencing high exposure to rapid and slow onset events, such as floods or sea level rise (Porio, 2014; 2016; IOM, 2021). For instance, in Davao City (Mindanao), the highest city population increase is experienced during the peak of on-set rapid events, due to the inflow of migration in cities accommodating informal settlers (IOM, 2021). Driven by the construction of high-end residential and commercial projects as well as the proliferation of informal

settlements, where residents lack basic services and are highly exposed to sea level rise, subsidence and floods, urban growth in Metro Manila has similarly led to higher vulnerability of marginalized groups of experiencing poverty and hunger (Porio, 2016). At the same time, the deepening income divide between newcomers and receiving communities may increase social and political tensions and, ultimately, conflict (Porio, 2011; 2016). Similarly, deprivation of coastal zones, driven by sea level rise as well as reduced fish captures, could lead to increased migration, tensions with neighbouring communities as well as perpetuation or incentives to initiate conflict (Ewing, 2009).

Smallholder farmers face considerable pressures to intensify or alter their agricultural practices to meet global development and market needs while often struggling to meet their food and nutritional security (Davila et al., 2019; Dressler et al., 2017; Fanzo, 2017). Across the Philippines, populations living in very low-density areas are characterized by high poverty and a greater prevalence of stunting and wasting (CIAT & WFP, 2021). This is compounded by the lack of diversity in sources of income, predisposing the sector to shocks that affect nutrition. In the Philippines, women and children are more susceptible to different human security risks such as trafficking, sexual abuse, prostitution as well as sexual favours in exchange for food in evacuation centres where there are food shortages (Chandra and Namara, 2017). In the southern Philippines, figures for the transit and trade of underage girls and young children for the purpose of forced labour and sexual exploitation are increasing, with an estimated number ranging from 60,000 to 100,000 (Chandra and Namara, 2017). Similarly, poor urban populations living in informal settlements face food and nutrition challenges (CIAT & WFP, 2021). Access to sufficient and nutritious food is limited by poverty and income levels, particularly in the Eastern and Southern parts of the archipelago (WFP, 2015). Areas with a high incidence of wasting and stunting due to exposure to climate-related hazards include Puerto Princesa City in Region IV-B in Luzon as well as the municipalities of Banga and Tampakan in South Cotabato in Mindanao (CIAT & WFP, 2021).

In the wake of climate change, increasing sea temperatures and precipitation shocks, as well as extreme weather events, may fuel lootings, attacks, recruitment of armed groups in the Philippines (Delina & Cagoco-Guiam, 2018; Eastin, 2018; Walch, 2018). For instance, the depletion of fish stocks and the consequent fishers' livelihood insecurity are linked to higher probability of engagement in piracy activities, including stealing cash, fish and valuables, as well as illegal armed groups such as Abu Sayyaf Group and the Moro National Liberation Front (Mayor 2019; Nautilus Institute for Security and Sustainability, 2007; Pomeroy et al., 2016; Williams, 2013). Statistical analyses indicate that an increase in the sea surface temperature is correlated with armed conflict-related violence, especially towards civilian population and exerted by the Communist Party of the Philippines, the most prominent non-state armed group in the country (Castro Vargas, 2021). This impact is mediated by a reduction in the production of corn and the volume of municipal marine fisheries production, especially anchovies and squid (Castro Vargas, 2021).

Loss of livelihoods linked to extreme weather can also fuel social conflict as well as looting of food and water products, when civilians perceive that government does not adequately address the crisis (Delina and Cagoco-Guiam, 2018). For instance, in Kidapawan (Mindanao), protests following the 2016 El Niño dry spell escalated into violent clashes with the police, with reports indicating two deaths and 116 injuries, including police officers and protesters (Delina and Cagoco-Guiam, 2018).

Agricultural production is one of the main intermediate variables explaining the connection between rainfall and civil conflict, as the decline of agricultural production leads to poor economic conditions, which increase fractionalization and strengthens insurgent groups, allowing them to inflict causalities on civilians and government forces not complying with their demands (Crost et al., 2018). Evidence indicates that Filipinos join violent extremist groups and organisations, such as Abu Sayyaf or the Bangsamoro Islamic Freedom Fighters, driven by kindship and poverty, rather than ideology (The Asia Foundation and Rappler, 2018). Joining an extremist group and becoming part of a gang is seen as a way to increase livelihood and food security, in addition to physical protection, as they are provided with arms and stable income (The Asia Foundation and Rappler, 2018). Precipitation shocks increase by 35 per cent insurgent-initiated attacks and by 43 per cent in government-initiated attacks (Eastin, 2018). While rainfall during the dry season is positively correlated with rice production and declined conflict intensity, rainfall during the wet season declines agricultural production of rice and leads to more conflict (Crost et al., 2018).

Rainfall shocks provide an opportunity for actors to amplify their capacity to attack the enemy in a relatively equal proportion and facilitate insurgent groups to inflict casualties on government forces and civilians not complying with their demands (Crost et al., 2018; Eastin, 2018). Increased rainfall in the previous year is positively correlated with more violent incidents in armed intrastate conflict due to the decline in livelihood and food security resulting from precipitation-induced loss of agricultural production (Crost et al., 2018: Eastin, 2016). Similarly, research focusing on the impact that the rapid-onset events, particularly of the typhoons Bopha in 2012 and Haiyan in 2013, had on The New People's Army recruitment concludes that disasters might weaken the rebel group for a time and in specific regions, consequently limiting its recruitment activities (Walch, 2018). Hence, the response to these type of humanitarian crises shapes the rebels' ability to take advantage of the situation and increase recruitment among discontent disaster victims time after natural hazards (Walch, 2018).

VOICES FROM THE FIELD - The unequal distribution of benefits from development and resilience building efforts undermine social cohesion, worsen the political legitimacy of local-level institutions, and prompt strategic exclusion from disaster recovery efforts

Investments from extractive industries, government agencies and international cooperation for development and resilience building are unequally distributed and promote political exclusion of the least well-off, thereby eroding social capital and collaborative capacities towards adapting to climate change. In some regions, government and international support, whether directed towards resilience or peacebuilding initiatives, may often end up being channelled through the municipal mayor and the barangay chairman. This centralized control of external revenue allocation can hinder its equitable distribution and hinder the intended benefits for the broader community.

Such is the case particularly under contexts of low political legitimacy and high-levels of political violence, as detailed above for the Butig case study. The selective distribution of development funds and social protection in accordance to political allegiances and clan-based alliances exacerbates existing vulnerabilities and reinforces the power dynamics that limit resilience-building efforts. For example, community members across Mindanao report that following extreme events, individuals known to support opposition parties are often excluded from government-provided relief and recovery assistance. Additionally, disaster response measures are frequently used as political tools against opposing parties (Medina et al., 2024).

Livelihood and food insecurity in Mindanao

The island of Mindanao in the Philippines evidences low development, a history of conflict, a high dependence on natural resources and a high exposure to climate change, all of which explain its high vulnerability to climate change (Bollettino et al., 2020; Ewing, 2009, PAGASA, 2018, Giles et al., 2019). It is considered the agricultural breadbasket of the Philippines, accounting for 40 per cent of the national agricultural production and 60 per cent of the agricultural exports (Giles et al., 2019). Meanwhile, access to basic needs is extremely limited, with 47 per cent of the population suffering from food security and 36 per cent of the population living in absolute poverty (Giles et al., 2019). This is both a cause and a consequence of the armed conflict that has displaced thousands of people since 2000. A total of 23,075 families remain displaced in Mindanao (Protection Cluster & UNHCR, 2022).

Increasing climate variability and extreme weather events are already having a strong impact in Mindanao. Recent trends have been characterized by heavier precipitations and longer periods of droughts (Giles et al., 2019). The Philippines' reliance on rain-fed agriculture, as well as high-value plantation crops, has consequently increased the region's risk to extreme weather events and vulnerability to international market volatility as well as led to increased considerable inequalities within the region (Giles et al., 2019). Projected changes in precipitation and temperature by 2050 are expected to have a major impact in the Philippines, damaging crops' productivity, incomes well as the livelihoods of those depending on them (Bollettino et al., 2020; Giles et al., 2019). Increases in the frequency and intensity of extreme weather events is expected to aggravate climate-induced displacement (Bohra-Mishra et al., 2017; IDMC & NRC, 2009). The possibility to invest in climate adaptation is strongly limited for many farmers who face high rates for land lease agreements coupled with recurrent crop failures that curtails their incomes (Chandra & McNamara, 2017; IDMC & NRC, 2009). Seasonal employment in urban areas is a common adaptation strategy used to stabilize family income, widely used by young women, widows, and wives in these situations (Chandra & McNamara, 2017).

Statistical evidence shows that an increase in the wet season rainfall is correlated with higher incidences of conflict the following year, particularly in rice-producing provinces (Crost et al., 2018). A 10 cm increase in wet season precipitation is associated with a decline of 0.54 in rice production (Crost et al., 2018). Findings suggest that damages and declining agricultural production linked to rapid and slow onset events may reduce the opportunity cost of joining insurgent groups, such as the New People's Army and the Moro Islamic Liberation Front (Crost et al., 2018; Fisher and Dugan, 2021). Rapid-onset events increase by 6.1 per cent the rate of terrorism in the Philippines in the five months after the disaster (Fisher and Dugan, 2021). Livelihood and food insecurity, combined with kinship ties, are among the main reasons behind the engagement and involvement with regional insurgent groups since early ages (The Asia Foundation and Rappler, 2018; UNICEF, 2019).

The response of public institutions to natural disasters is also considered an important aspect influencing the engagement of insurgent groups, lower levels of satisfaction in the population regarding the government's response are linked to higher rates of terrorism (Fisher and Dugan, 2021). In conflict-affected areas of Mindanao, many children grown up in marginalized and insecure households, unable to support children's access to formal education and with strong family and social ties with the Moro Islamic Liberation Front are associated with higher likelihood of recruitment by its military wing, the Bangsamoro Islamic Armed Forces, and its women brigade, the Bangsamoro Islamic Women Auxiliary Brigade (UNICEF, 2019).

VOICES FROM THE FIELD - Climate resilience and political legitimacy in Mindanao

Low political legitimacy is considered the main driver of conflict risks within the BARMM. Ultimately, it is the absence of a legitimate entity capable of supporting local populations through security, protection and capabilities to maintain a livelihood that shapes people's vulnerability to recruitment and violent uprising. In this post-conflict environment characterized by low political legitimacy and a high risk of conflict resurgence, the region faces substantial obstacles towards building climate resilience.

The dominance of clan-based political influence has posed challenges to maintaining stable political legitimacy in the region since the United States colonization period (Lara, 2014). Local political elites in the region adeptly navigate the intricate web of institutional networks, which comprise both traditional relationships engrained in the Sultanate system, authority rooted in hierarchies from insurgent organizations, influence over Mindanao´s informal and illegal ("shadow") economies, and formal political structures. Their skilful manoeuvring within these networks is primarily aimed at securing advantages and benefits for individuals and groups who actively support their position of authority. These elites leverage alliances and affiliations that bolster their political reach. This quite often occurs at the expense of local development and effective state building processes that would benefit local populations (Medina et al., 2024).

Livelihood and food insecurity in the Southern coast

The development of more efficient fishing technologies has led to over-fishing and exploitation of fish stocks in Southeast Asian waters, causing increased poverty among fishers, particularly those owning small vessels, and coastal populations (Nautilus Institute for Security and Sustainability, 2007). This poverty has driven some of these individuals to engage in pirate attacks as a means of supplementing their income (Nautilus Institute for Security and Sustainability, 2007). In 2018, incidents of piracy in the Philippines doubled compared to 2016, with 22 incidents reported, many of which involved the kidnapping of ship crews (Maylor, 2019). The link between illegal fishing and other illegal activities, such as piracy, fuel smuggling, human trafficking, and kidnapping, has further contributed to instability and insecurity in the Southeast Asian region (Williams, 2013).

Rising sea temperatures and ocean acidification have accelerated the decline of marine resources (Salayo et al., 2006; Sumalia et al., 2021). The scarcity of fish stocks and the resulting livelihood insecurity has compelled traditional fishers to resort to illegal fishing, piracy and involvement with terrorist organizations (Pomeroy et al., 2016). The decreased availability of fish stocks and related livelihood insecurity has contributed to increasing illegal fishing in foreign waters, making fishers vulnerable targets for pirate attacks (Nautilus Institute for Security and Sustainability, 2007). Governance gaps have allowed maritime terrorist organizations to profit from the economic instability and poverty caused by the depletion of fish stocks in the Sulu and Basilan islands and the Zamboanga Peninsula region (Maylor, 2019). This has led to the presence and activity of terrorist groups such as the Abu Sayyaf Group and the Moro National Liberation Front (Maylor, 2019). Fishers' expertise in sailing with small vessels is seen as a valuable skill for conducting maritime attacks, and the illegal production and trafficking of fertilizer-based bombs has increased insecurity levels in the Southeast Asia region (Pomperoy et al., 2016; Nautilus Institute for Security and Sustainability, 2007). The threat of these bombs being used by insurgent or separatist movements in terrorist attacks adds to the overall insecurity in the region (Pomeroy et al., 2016).

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About CGIAR FOCUS Climate Security

CGIAR aims to address gaps in knowledge about climate change and food security for peace and security policies and operations through a unique multidisciplinary approach. Our main objective is to align evidence from the realms of climate, land, and food systems science with peacebuilding efforts already underway that address conflict through evidence-based environmental, political, and socio-economic solutions.