

# Forests in the Anthropocene

*Perspectives from the Philippines*

Antonio La Viña  
Jose Andres Canivel  
Donna Paz Reyes

EDITORS



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Perspectives from the Philippines

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# Preface

*Forests in the Anthropocene: Perspectives from the Philippines* is one of the Forest Foundation's endeavors to share historical reflections and contemporary lessons of our local forestry sector. This book was originally conceived as an assessment of the Foundation's Forest Conservation Results Framework covering the years 2017 to 2021. In the discussion process, we came to realize the value of sharing institutional lessons in conservation with the broader public. This was supposed to have been launched during the 2020 Conference of Parties of the United Nations Climate Change Framework Convention as the Foundation's contribution to the growing global discourse on the importance of forests in climate change adaptation and mitigation. We also hoped to organize a national conference as a platform of academic exchange on the emerging scientific discussions and evolving discourse on the forests among Filipino scholars. Amid limitations and adjustments brought by the COVID-19 pandemic, the Foundation together with partner organizations and contributing scholars persisted to complete the book. This project serves as an affirmation of the need for the amplification of our local scientific voice in forestry, that our distinct perspectives matter and deserve space in this age when anthropogenic impacts to nature, despite being beyond debate, are in need of continuing discourse.

The Forest Foundation believes that true conservation requires being engaged directly on the ground, hand-in-hand with grassroots forest communities who are forest conservation frontliners. We visit our project sites and take part in monitoring or reforestation efforts and lend a hand to the community. In one such project site, I joined in soil potting and preparation of native tree wildlings in a community-managed nursery. There were many community members taking part, from grade school children to senior citizens. Representatives from our government partners and some volunteers were also eagerly involved. Interestingly, smaller hands were able to plant the wildlings better. We adults with larger hands passed several bags with planted wildlings to others who arranged them in rows in the chambers. At the end of the afternoon, we all shook hands or gave each other high fives, congratulating each other for a job well done. The memorable experience was illustrative of how our collective work in conservation is paved by small steps and numerous helping hands.

The forest is a landscape of vital lessons for our society. The process of this book, its conceptualization and production, has likewise led to the following realizations.

First, maintaining and restoring Philippine forests is largely dependent on active and collaborative human intervention. In their natural state, forests will thrive without humans. Humanity, on the other hand, needs the forest for its continued existence and for society to thrive. Hence, forest conservation, protection, and restoration should be upheld as our shared responsibility, an environmental pledge and legacy for future generations.

Second, historical retrospection of our forestry sector highlights how persisting human-induced forest denudation and deforestation have led to consequent erosion of ecosystem services, stagnant economic development, disaster risks, and vulnerability particularly of the rural poor. It is urgent and an imperative that the strategic role of sustainable forest management be decisively instilled in our national and local development programs in paper, policy, and practice. Sustainable forest management is key to address urgent challenges in climate mitigation and biodiversity conservation, as well as prevalent development issues of chronic poverty, agrarian underdevelopment, land rights, and environmental justice.

Third, recent scientific explorations have linked the COVID-19 pandemic with deforestation, ruptured ecosystems, and unhampered encroachment of human settlements in wildlife areas. This unprecedented crisis has also increased pressures on forest resources and threats of extractive exploitation while limiting the mobility of and draining resources for restorative action. The imposed quarantine, particularly across dense urban areas, has highlighted the phenomena of nature deficit syndrome as people realize the fundamental need for green spaces and nature connection as a source of rest, recreation, and overall well-being. Our collective pandemic experience is a wake-up call for us to recognize the strategic role of ecological restoration, forest rehabilitation, and conservation as a fundamental pillar in addressing the immediate and long-term social health, food security, and economic resilience development agendas.

I thank the writers, researchers, artists, and editors who worked on this book. My sincere gratitude as well to the members of the Board of Trustees of the Foundation, Foundation staff, and most especially our partners, without whom the book could not have been written.

To rise to forestry challenges in the Anthropocene, there is a need for decisive reforms in environmental governance and progressive social action coupled with a rekindling of our nature-culture relationship. Our nation needs to affirm our political commitments for forests and nurture a deeper ecological consciousness.

We hope that this book enables more hands to restore and rehabilitate rather than cut and degrade; to sustain and uplift community forestry enterprises rather than exploit impoverished rural uplands; and collaborate

with indigenous peoples and forest-dependent communities rather than disenfranchise them. This book is just a glimpse of the wealth of lessons, wonder, and wisdom derived from forests and peoples across the archipelago. Nonetheless, may this be a seed of inspiration that will spur expanding branches of ideas and actions among individuals, organizations, and communities whose heartbeats and hands are united in the restoration and rehabilitation of our forests.

**Jose Andres Canivel, JD**

Executive Director



# Introduction

Antonio La Viña, Jose Andres Canivel, and Donna Paz Reyes

## **Continuing Pathways and Partnerships in Community Forestry and Conservation**

The beginnings of the Forest Foundation Philippines were a hopeful seed cast in the historical juncture when paradigm shifts toward forest conservation and protection resounded in national policy reforms but had yet to gain track in institutional practice. Its inception was part of institutional responses and policy reforms to curb historical forest decline and protect the remaining contiguous forest biodiversity corridors from decades of unhampered exploitation and conversion. The Foundation's strategic framework affirms that the daunting tasks of realizing the progressive potential of the Philippine forests through the framework of community forestry and conservation are imperative to address the sustainable development challenges of the country.

Established in 2002 as a “debt-for-nature” mechanism under two bilateral agreements signed by the US and Philippine governments, the Forest Foundation Philippines provides grant funding and support for community forestry and bolstering forest conservation and protection programs. Formerly known as the Philippine Tropical Forest Conservation Foundation, Inc. (PTFCF), the Foundation adopts the sustainable forest landscape approach, which emphasizes the nature of forests, people, and development as interdependent elements of a larger landscape. It facilitates the use of science-based decision-making and multi-stakeholder participation in meeting the needs of local communities and in attaining country-level targets while contributing to the fight against climate change on a global scale.

In the past decade, the Foundation has improved its systems to ensure that program implementation is complemented with community development approaches, institutional capacity building, scientific research, and active public communication in effectively mainstreaming forest management and conservation-related concepts to the broader public, conservation practitioners, and policy actors. Artists, educators, scientists, and the optimistic force of the youth are tapped as networks and advocates for forest protection and conservation through creative information, education, and advocacy activities.

Bridging local knowledge and scientific expertise has played a crucial role in developing valuable technological resources for sound project management, effective community-led conservation, and evidence-based, science-driven policy recommendations at the local and national levels. An example is adopting the Rainforestation approach that simulates natural forest growth through the planting of pioneering local species and climax forest trees in succession. This encourages the shift to native species instead of relying intensively on exotic species for our country's reforestation efforts. Likewise, community-managed forest nurseries and locally protected mangrove areas and watersheds have become learning hubs where citizen science, local knowledge, and scientific and academic actors weave their theory, practice, and expertise to attain praxis in conservation.

In its strategic planning for 2017–2021, the Foundation recognized that the achievement of our national goals in forest protection, conservation, and rehabilitation remains wanting. This led the Foundation to recalibrate its institutional focus toward protecting focal landscapes that host biodiversity hotspots, remaining contiguous canopies, and critical watersheds within the forest regions of Palawan and Sierra Madre in Luzon, Samar and Leyte in Visayas, and Bukidnon and Misamis Oriental in Mindanao. In its Results Framework 2017–2021, the Foundation focuses on four target outcomes—dubbed as Grow Forests, Grow Livelihoods, Grow Partnerships, and Grow Advocates—using a sustainable landscape approach toward the protection and sustainable management of Philippine forests and biodiversity (Figure 1). This program plan combines more than a decade of experience in grants management with crucial elements from various national framework strategies.



**FIGURE 1.** Forest Foundation Philippines Results Framework 2017–2021

Amid the realities of structural, governance, and institutional challenges, conservation experiences from the ground reveal hope beating from the well of creative potentials, collective action, and common aspiration of communities and advocates in the frontlines of conservation. The Foundation reaffirms the principles of people-oriented and process-oriented community forestry as its guiding framework along with the sustainable landscape approach. This also highlights the realization that forest stakeholders navigate uneven terrains of power, complex histories, contesting resource interests, and tangled institutional dynamics. This includes adherence to rights-based approaches including the promotion of tenure security, social equity, resource rights, local knowledge systems and practices, and enhancing women's participation and leadership. It recognizes that sustainable forest management entails upholding environmental justice, addressing rural development issues, empowering communities, and promoting viable livelihoods. Forest conservation program objectives take root when processes instill collective commitment, collaborative action, cohesive organizational leadership, and shared accountability particularly among multiple stakeholders. Through shared advocacy and principled unity, the network and partners of the Foundation comprised of development NGOs, local people's organizations, conservation networks, academic institutions, local government units, and national and international networks have grown over the years.

### Situating Forests in the Anthropocene

Since being coined by atmospheric chemist Paul Crutzen, we have witnessed growing scientific debate and conjunction across disciplines on the phenomena of the Anthropocene, or the human-dominated geological epoch. Its inception, the propriety of its use, and the consequences of institutionalizing the Anthropocene as a geological marker has sparked many questions and even more debates.

The temporal and geological nuances of the Anthropocene is articulated in the exhaustive exposition of Jeremy Davies's book *The Birth of the Anthropocene*. He discusses in no uncertain terms how human actions have made immensely significant ecological impacts such that the new geological epoch has become a certainty. As expected, his scientific arguments triggered critiques and probing inquiries. Other climate scientists have also observed that the global temperature during the Holocene when compared to the Cenozoic era as a whole, and even most of the Pleistocene epoch, was "relatively stable," the biggest change having been a drop in the temperature of the earth of about 0.7°C millennia before the twentieth century. This has led to Davies's proposal that the birth of the Anthropocene, in actuality, means that "the planet is currently departing its twelve-thousand-year period of relative ecological dependability" (2016) because of the participation of humans, our increasing

population, and the onset of civilization as we know it today. One need only to review the commitments made in the Paris Agreement to understand how much the planet has changed, and how quickly it is foreseen to further change in the next few years.

Davies concluded his work by sharing with the reader four possible changes of emphasis and lenses by which to view the Anthropocene. The first is of utmost importance: thinking through the Anthropocene demands (and rightly so) an avowedly global perspective. The Anthropocene, however it is couched to be—whether an environmental, ecological, or economic event—is a phenomenon that accentuates differences, particularly between the global North and South, the latter being comprised of countries most vulnerable to an increasingly warmer planet, the former considered to be the biggest contributors to climate change. His proposition echoes the critical inquiry, geographic standpoint, and historic outlook of social scientists regarding the Anthropocene. Many sociologists and geologists make mention of the “Great Acceleration,” a time when the United States first rose to power, consumerism became the norm, and socioeconomic trends increased dramatically. In the same vein, critical scrutiny of the underlying political-economic roots of the Anthropocene have steered the conversation from the natural scientific perspective toward a deeper introspection of the capitalist structures and pedestals of power. To this end, “Capitalocene” was argued as the more historically appropriate term, as according to Moore (2019) who extensively used the term, we are in the “Age of Capital” and we know who is responsible for the climate crisis. To claim it as anthropogenic climate change, without looking at capitalism, would be to distribute the blame of climate change to the victims of exploitation, violence, and poverty, when in reality, the responsibility for climate change is attributed to the dominant utilitarian worldview on ecologies, tilted power relations on resources rights, and the resulting environmental injustice and disproportionate socio-environmental impacts brought by capitalism’s parasitic exploitation of natural ecosystems. Meanwhile, McBrien (2016) expands on the Capitalocene by arguing for the recognition of the “Necrocene” as a fundamental biogeological moment of the Capitalocene. He writes that the accumulation of capital is the accumulation of potential extinction, including the extinguishment of cultures, languages, peoples, and the Earth.

The discourse on Anthropocene continues to gain traction not just in the academic and artistic realms. Our collective historical social experience of the global climate crisis, toxic pollution, and drastic ecological changes have made the indelible imprint of human civilization more apparent. A quick perusal of news today reveals inconvenient, uncomfortable truths: the years that comprise the last decade rank among the warmest years ever recorded; the global sea level has risen by more than six inches since the dawn of the twentieth century; natural phenomena in the form of typhoons and droughts, among others, have become much more frequent and intense; and the rise in the amount of greenhouse gases trapped in the atmosphere, largely a

result of a globally industrialized world, has led to unprecedented changes in such a short amount of time. Even as all these have been taking place, other things have occurred: mass endangering, if not extinction, of flora and fauna; geomorphic changes; coral bleaching as a result of a slowly acidified ocean; and the rise of climate-specific issues such as climate migration and the distinct presence of trace elements in the soil, water, and atmosphere.

On the part of forests specifically, many studies have been made in view of the Anthropocene with regard to biodiversity, as anthropogenic climate change has inevitable effects on ecosystems and therefore needs new approaches in biodiversity conservation. The awareness of the immensity of human actions on the increasing scale and rapidity of biodiversity loss has led to a number of studies that look into forests through the lenses of Anthropocene. This includes studies on plant biodiversity (Vellend et al. 2017), policy changes, forest conservation and development (Schlichter and Montes 2012), and even documentation on indigenous peoples and communities who both live in and find their livelihood from forests. Though questions on when the Anthropocene dawned over man (or if it already even has) are still left unanswered and debated upon, global and regional forest trends are clear evidence of human impacts on the natural world, many of which are unprecedented in character, and the effects of which we will only fully understand centuries, even millennia, hence.

The history of deforestation and denudation are irrefutable examples of how natural ecologies are increasingly shaped and enmeshed in complex political-economic and social-cultural processes. The global loss of forest cover is directly correlated with the rise of modernity and industry. Persistent anthropogenic forest decline continues as recent estimates reveal a global loss of 80 million hectares since 1990. Average deforestation rates marked 8.5 million hectares per year between 1990 and 2000 and 6.6 million hectares per year between 2010 and 2015 (CIFOR 2016). This bleak trend is exacerbated by recent climate change-induced forest fires which led to loss of 11.9 million hectares in 2019 across major forest regions, especially tropical humid forest corridors (FAO and UNEP 2020).

The Philippines, being both part of the global South and a hotbed of biodiversity, is no stranger to this unfortunate reality. Our forests are one of the most impacted by human activity. Deforestation in order to build residential or commercial areas, mining, and agricultural fires, among others, have contributed to the loss of approximately 47,000 hectares of forest cover annually, and the country is down to less than 24 percent of its original forest cover since the 1900s (Cabico 2018). This has led to catastrophic results during the typhoon seasons as inundations have become far more widespread and common. The loss of forest cover also means loss of habitat, both for the indigenous communities living in the area and the flora and fauna found therein.

Understandably and consequently, these are not the only impacts of human activity on Philippine forests. Corollary to issues on survival are

concerns spanning livelihood and security (as environmental defenders including forest rangers' lives depend on the continued existence of Philippine forests), governance and policy, and health and renewable energy, all taking into consideration the country's needs and obligations to its citizens toward sustainable development and economic growth. This book hopes not only to help future forest advocates understand the impact of people on Philippine forests, but also to give an overview of what has been and could be done to realize forest conservation objectives, promote environmental justice, ensure inclusive development, and amplify the call for ecological restoration of our forest landscapes.

### **Pondering Perspectives from Philippine Forestry in the Anthropocene**

The anthropogenic nature of the global climate crisis and cross-cutting socio-environmental challenges have highlighted the historical imprints of humanity on the natural world, including the forest ecosystems. This engendered renewed interdisciplinary scientific attention to the dynamics of people and forests and amplified the need to critically understand crucial ecological services of forests, biodiversity conservation, traditional ecological knowledge, forest livelihoods, institutional dynamics, policy issues, and resource-based conflicts that are embedded in diverse forest landscapes. Untangling these complexities and challenges in sustainable forest management have also echoed a clarion call for a multilevel and integrated policy response towards forest conservation and protection as an imperative for realizing sustainable development goals and climate mitigation.

This prompted the Foundation's Learning Landscapes Program to consolidate lessons and distill research insights from the rich array of Philippine forest conservation policy and practice. Our local forestry sector's turbulent history, complex governance dynamics, critical policy lessons, and social narratives provide a depository of perspectives to examine Philippine Forestry within the evolving discourses of the Anthropocene.

This book shares a compendium of Filipino scholarship on the interplay of our forests and peoples in the Anthropocene across the archipelago through an interdisciplinary perspective.

Chapter 1, "Forest Conservation in the Philippines: Linking People, Forests, and Policies" by Juan M. Pulhin, Ma. Louiella Rose O. Catudio, and Perlyn M. Pulhin-Yoshida provides a national historical overview on the intricate dynamics between people, forests, and policies in the country's convoluted history of deforestation and forest degradation viewed through the lenses of social, political, economic, and cultural influences. Lessons from the paradigm shifts toward the Community-Based Forest Management (CBFM) Program are also chronicled, revealing that its policy rationale is yet to

be realized. Despite sound laws and policies supporting its implementation, the main legal, political, and economic orientations of the country remain inconducive to ushering sustainable forest management. Nonetheless, potentials and pathways are present to strengthen and consolidate the ongoing scientific, multisectoral, and collaborative actions. The chapter calls for an integrated approach to harmonize all efforts from various sectors at different levels. Doing so entails a shift to more ecologically rooted human-nature relations and imperative to anchor responsive policies and programs on good governance principles to usher positive changes and beneficial contributions of the forestry sector to both the environment and society.

Delving deeper, the succeeding chapters of the book share case studies, social experiences, sustainability issues, and policy perspectives depicting the dynamics of varied forest ecosystems, communities, and diverse institutional actors across the archipelago.

The dynamics of conservation programs and community forest governance are analyzed in Chapter 2, “A Networked Landscape?: Using Relational Structures to Examine the Implementation of Community-Based Forestry Projects in the Mount Kalatungan Mountain Range” by Le Anh Nguyen Long, Catherine Diaz, and Mart Thomas Kyle P. Markines. Through social network analysis (SNA), mapping relational structures are used to examine institutional dynamics within community forestry projects involving indigenous forest communities in Mount Kalatungan Mountain Range. The analysis reveals how indigenous knowledge and practices facilitate forest-culture interactions. It demonstrates how network analysis can enhance understanding of institutional interactions, binding or conflicting interests, and drivers and barriers of collaboration and communication between diverse actors within a forest landscape. These serve as useful guidelines for conservation program actors with their organizational diagnosis, collaboration, communication, and conflict management strategies. SNA findings can also be triangulated with other methodological tools and community development processes to fully unpack the complexities of institutional dynamics inherent in forest landscapes.

Chapter 3 brings to fore the need for scholarship attention to the important yet obscured contribution of *bantay gubat* or forest rangers as ubiquitous actors in forest conservation and protection. Through an anthropological approach, “Protecting the Environment: An Exploration of the Roles, Motivations, and Lived Experiences of Forest Guards in the Philippines” by Gideon Lasco documents the social narratives of forest guards serving within critical forest and biodiversity areas in Luzon and Northern Mindanao. Common themes that emerged include the sense of financial, physical, and legal vulnerability; lack of recognition; the role of politics in their work; and a range of motivations including a strong sense of identity and a conception of the mountains as “home.” Descriptive findings and analytical insights provide information to improve relevant policies and programs, support arguments for greater support and recognition for their

work, as well as serve as baseline data for further research to understand the many other contexts and environments of forest guards.

Forest conservation, culture, and livelihood interactions are further examined in Chapter 4, “Indigenous Forest Livelihoods in the Anthropocene: Social-Ecological Assessment of Abacá (*Musa textilis*) and Giant Honey Bee (*Apis dorsata* F.) Indigenous Forest Enterprises through a Transdisciplinary Approach” by Dr. Denise Margaret S. Matias, Hanna Claudine Gallardo, Sean Alain Betonio, and Mar Xyle Marisse Bacas. The forest biodiversity, ecosystem services, and traditions (BEST Forest) of honey from giant honey bees (*Apis dorsata*) and hinabol fiber from abacá (*Musa textilis*) livelihoods in the Bukidnon and Misamis Oriental landscapes are examined. Highlights of the study reveal that normalized difference vegetation index (NDVI) analysis of the Higaonon community forest from the past 15 years shows that community forest enterprises could support indigenous livelihoods while maintaining forest cover. The transdisciplinary approach enabled a more holistic examination of how abacá and wild honey forest livelihoods integrate traditional knowledge, sustainable forest practices, and conservation-oriented organizational processes and contribute to decreased natural resource exploitation pressure on their forests. These culture-forest interactions within forest livelihoods are worth exploring in the Anthropocene where potentials for conservation projects can integrate factors that enhance multiple ecological, cultural, and economic benefits for forest-dependent communities.

The last two chapters focus on the intersections of sustainability and policy in forest governance with the water and energy sector.

Despite the intricate relation of the global energy system with climate change and forests in the Anthropocene, the forest conservation and energy access nexus remains unexplored in the context of the country’s institutional, legal, and policy frameworks, which is reflected in the lack of research and literature looking into such linkages. Chapter 5, “Exploring the Nexus Approach in Forest Conservation and Energy Access for Policy Integration and Coherence in the Philippines” by Manuel Peter S. Solis, attempts to appraise this interlinked gap in policy discussion. It proposes that the challenges of ensuring forest conservation are linked to realizing sustainable and accessible energy services. The pitfalls of policy and decision-making in silos when tackling forests and energy access impede the creation of an enabling environment for responsive policy integration and coherence. Such are development obstacles as well for interlinked sectors and stakeholders who are most vulnerable and marginalized in society, especially among the majority of rural households as the basic social and consumption unit. Hence, a holistic examination of closely intertwined issues and policy gaps arising from forest conservation and energy access is useful in developing a more progressive framework to enable coherence, support integrated approaches, and promote cross-sectoral collaboration to realize common or shared objectives. Such is worth exploring against the backdrop of climate

change wherein sustainable energy systems and forest conservation goals are intertwined and primary challenges in the Anthropocene.

In Chapter 6, “Examining Sustainability Issues in the Water Dependent Economy of Downstream Sectors in the Cagayan de Oro River Basin” by Catherine Almaden, a synthesis of in-depth research studies reveals the embedded complexity and intersecting challenges of realizing integrated watershed management and sustaining vital ecosystem services, particularly water for expanding multi-stakeholders in Cagayan de Oro City. The study critically analyzes the status of interrelated pressures to water management within the Cagayan de Oro River Basin (CDORB) that pose sustainability issues. The review and analysis of the sustainability issues of the various downstream users in the CDORB provide insights on how competing water demands are likely to play out in different settings from expanding and often competing residential, industrial, and tourism water users. It resounds the critical imperative for an evidence-based, multi-stakeholder and integrated approach in watershed management to address the ongoing anthropogenic water stress, prevailing watershed degradation and its resulting sustainability issues. It reiterates the need for sound policy, enforcement of regulatory mechanisms, strategic and integrated watershed management frameworks to respond to the exacerbating intermittent floods and water shortages, and the consequent social and economic impacts of climate extremes as felt in the region.

The chapters in the book provide an examination on the layered realities that envelop the forest landscapes, particularly focal conservation areas in Sierra Madre, Palawan, Bukidnon, and Misamis Oriental. The scope of case studies and discussions are highly relevant scientific information and policy inputs in improving approaches and frameworks in the Foundation’s commitment to Grow Forests, Grow Livelihoods, Grow Partnerships, and Grow Advocates. Research findings will serve as crucial information for decision-making toward improving the Foundation’s programs, designing participation models, building organizational capacities, and enhancing partnerships, programs, and advocacy strategies.

Given this broad scope, the book does not attempt to exhaust the numerous themes that can be tackled when exploring the mosaics of forest landscapes within the Anthropocene. Rather, this initial volume hopes to prompt attention, broaden the conversation, and elucidate reflections both from the forestry sector and diverse societal sectors toward a deeper appreciation, hopeful vision, social commitment, and collective action for the protection and conservation of the Philippine forests.

## References

- Cabico, G. K. 2018. "Recovering the Philippines' Forest Cover," *Philstar*, 4 March. <https://www.philstar.com/headlines/2018/03/04/1793446/recovering-philippines-forest-cover>.
- CIFOR (Center for International Forestry Research). 2016. CIFOR Strategy 2016–2025: Stepping up to the New Climate and Development Agenda. Bogor, Indonesia: CIFOR.
- Davies, J. 2016. *The Birth of the Anthropocene*. Oakland, CA: University of California Press.
- FAO (Food and Agriculture Organization) and UNEP (United Nations Environment Programme). 2020. *The State of the World's Forests: Forests, Biodiversity and People*. Rome: FAO and UNEP.
- McBrien, J. 2016. "Accumulating Extinction: Planetary Catastrophism in the Necrocene." In *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*, edited by J. W. Moore, 116–37. Oakland, CA: PM Press.
- Milan, P. P. 2020. *Rainforestation: Paradigm Shift in Forest Restoration in the Philippines*. Makati: Forest Foundation Philippines.
- Moore, J. W. 2019. "The Capitalocene and Planetary Justice." *Maize* 6: 49–54.
- Schlichter, T. and L. Montes, eds. 2012. *Forests in Development: A Vital Balance*. Dordrecht: Springer.
- Vellend, M., L. Baeten, A. Becker-Scarpitta, V. Boucher-Lalonde, J. L. McCune, J. Messier, I. H. Myers-Smith, and D. F. Sax. 2017. "Plant Biodiversity Change Across Scales During the Anthropocene." *Annual Review of Plant Biology* 68 (1): 563–586.





# FOREST CONSERVATION IN THE PHILIPPINES: Linking People, Forests, and Policies

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## Abstract

As Earth progresses into a new geologic epoch called the Anthropocene, the Philippine forestry sector faces greater challenges as deforestation and forest degradation become more apparent. Severe and irreversible impacts from human-induced activities have ushered the country into this new epoch, shaped by colonization, industrialization, modernization, commoditization, and various laws and policies throughout history. Delving deeply into these issues shows the progression of human-environment relations from a once-mutual connection to an anthropocentric relationship that accelerates forest loss. To save the remaining forests, the country has leveraged its resources through the enactment of Executive Order No. 263, which declared the Community-Based Forest Management (CBFM) Program as the national strategy for sustainable upland development. After decades of implementation, the program has reaped various successes. However, numerous entanglements with issues on weak accountability structure, poor community participation and transparency in decision-making, bureaucratic apathy, and corruption have thwarted most of its intended benefits. These concerns further intersect with contemporary problems on environment, socioeconomic, health, and policy sectors—way beyond the forestry sector. In light of this, the call for an integrated approach to harmonize all efforts from various sectors at different levels through responsive policies and programs anchored on good governance principles is imperative to incur positive and beneficial changes to these contemporary issues. This chapter provides an overview of the intricate relationship among people, forests, and policies viewed through the lenses of social, political, economic, and cultural influences in the Anthropocene.

## Introduction

Flourishing biodiversity and a high level of endemism in flora and fauna are evident products of the archipelagic nature, complex biogeographic pattern, and well-suited tropical climate of the Philippines (Jones and Kennedy 2008). Various ecosystems possess a unique set of taxa essential for the support of different life forms. The synergy between human ingenuity and abundant natural resources has been evolving since the Neolithic Age<sup>1</sup>, as reflected in the emergence of agriculture (Peralta and NCCA 2000). As the centuries progressed, humans learned to effectively manipulate their environment to their advantage. However, most of these changes turned out to be more pervasive and profound, thus affecting the Earth's major biogeochemical cycles (Lewis and Maslin 2015; Malhi 2017; Steffen, Crutzen, and McNeill 2007). The magnitude, variety, and longevity of human-induced activities in the past created significant changes which went beyond the range of variability defined by the Holocene.<sup>2</sup> This caused the Earth to progress into a new geological epoch dominated by man, which is called the Anthropocene (Lewis and Maslin 2015; Malhi 2017; Steffen et al. 2011).

The Anthropocene is the product of profound and pervasive anthropogenic driving forces that have been occurring and evolving since the previous century. These driving forces are built upon individual decisions strongly tied to institutional, political, economic, and cultural factors conditioned by broad historical trends and global processes that directly or indirectly aggravated the environment (Rosa et al. 2015). Fossil fuel exploitation, forest resource extraction, land conversion, and carbon emission are some of the driving forces that became prevalent in pursuit of the insatiable demands of the burgeoning population. The consequences of these past actions are not confined within spatiotemporal limitations but transcend national boundaries and age, causing global peril to the current and future generations as they reap the long-term impacts of these actions (Malhi et al. 2014; Steffen et al. 2011).

From the context of developing countries, the apparent manifestations of the Anthropocene are the modifications that humans made to their environment (Malhi et al. 2014). For instance, most of the lush green forests of the Philippines disappeared and were replaced by a landscape of sloping rice and corn fields, numerous coconut trees, crowded houses, compacted and cemented roads, populated villages, and sparse emerging trees. The country has significantly lost vast tracts of its densely canopied tropical forest, with 21 million hectares of forestland in 1900 dwindling to around 7 million hectares at present (Lasco and Pulhin 2000). Physical alterations brought by deforestation and forest degradation seem to be the strong proof of the Anthropocene, yet the greater concern for this new epoch are the prevailing forces that govern these destructions.

This chapter provides an overview of the intricate relationship among people, forests, and policies in the country's complex history of deforestation

and forest degradation viewed through the lenses of social, political, economic, and cultural influences. It then examines how these influences, in return, left an indelible impact on the citizens of the Philippines, its forests, and its policies by magnifying some key concepts. Lastly, the chapter chronicles the emergence of forest conservation and community forestry, including the reflections from the country's implementation of the Community-Based Forest Management (CBFM) Program in the Anthropocene.



### Traversing the Path of the Anthropocene: A History of Forest Destruction and Degradation

The Anthropocene as an epoch is a recent concept, yet its existence has long been felt and recognized. Increasing global temperature, unprecedented climate change, and natural disasters are few indications of an age that is different from the previous one. These changes are the by-products of the individual and collective decisions and actions in the past that have now shaped the current world. A retrospection of Philippine history reveals how the Anthropocene has been deeply hemmed by various forces resulting in contemporary problems. Behind the country's history of colonization lies the dreadful narrative of forest destruction and degradation. Delving into these realities reveals more than the physical alterations, but the sudden transformation of the human-environment interaction. From mutual connection to an anthropocentric relationship, indeed, colonization of the land has also led to the colonization of minds. With global pressures on industrialization, modernization, and commoditization, the path leading to the Anthropocene, for developing countries such as the Philippines, is inevitable.

#### **Antiquity:<sup>3</sup> Nature and the Early Man**

Earliest human accounts precisely portrayed a mutual connection between humans and their environment. As early as the Neolithic Age, indigenous peoples (IPs) across the country learned to improve and manage their environment in a manner consistent with its natural processes (NCCA 2000; Camacho et al. 2016). Sustainability of natural regeneration capacity and environmental protection were the principles that governed their resource

extraction. The culture of the IPs reflected the deep connections and high regard they had for nature. Evidently, conservation and protection of the environment were ingrained in their hearts and minds with the desire to maintain their harmony with nature (Camacho et al. 2016; ILO 1995).

For instance, the culture of the Ifugao, an indigenous community that inhabits the mountainous part of Northern Luzon, was harmoniously knit with the rugged ecosystem on which their major livelihoods depended. Perfectly carved terraces, known as *payoh*, manifested their commendable indigenous knowledge. Although these terraces greatly altered the mountains, their design was recognized worldwide as one of the most productive, stable, and sustainable farming systems. Payoh, together with *muyong* or *pinugo* (woodlot) and *uma* (swidden), comprised the holistic farming approach of the Ifugao. Payoh were primarily constructed to maximize the use of available water resources for rice cultivation. It was designed to provide continuous water supply and prevent waterlogging of the cultivated rice. The intricacies of the construction, utilization, and maintenance of the terraces were products of their understanding and close association with nature. In choosing the rice varieties, the Ifugao considered those that could adapt with the season and soil nutrient capacity of their payoh.

After sowing the rice in payoh, the Ifugao would cultivate their *uma* with annual crops such as *kamote* (sweet potato), beans, corn, *gabi* (taro), roots and tubers (yam, cassava), squash, and other leafy vegetables together with perennial crops like banana. Aside from *kaingin* (swidden farming or slash-and-burn),<sup>4</sup> the Ifugao also employed a fallow period of five to six years to replenish the soil fertility in their *uma* (Camacho et al. 2016; ILO 1995). They also used *muyong* typically located at the headwaters. The plot was dominated by trees, particularly the dipterocarp species, pine trees (*Pinus kesiya*), narra (*Pterocarpus indicus*) and other fuelwood species. *Muyong* were usually clan-owned and were meant to supply wood for house construction, repair, and wood carving. The close interaction of the Ifugao with the mountains helped them understand the role of *muyong* in the maintenance of the ecological balance of their overall farming system. With this, they gave the protection of the headwaters utmost importance to ensure the stability of their water sources (Camacho et al. 2016; ILO 1995).

Citing another early account of human-environment connection, rich experiences with the mountainous environment led an indigenous community in Bayyo, Mt. Province to specialize in crop rotation, mixed cropping, soil fertility management, and a sweet potato cropping system. The tribe members practiced these cropping systems to maximize the land productivity without compromising the natural ecological processes. Similar to the Ifugao case, this indigenous community utilized *payew* (terraces) for rice cultivation. Yet, instead of a rice-to-rice cropping system they learned that rice-to-sweet potato was the best rotational cropping system to ensure good rice growth for the next planting season. Mixed cropping of vegetables was also practiced in the *payew* along with peanuts to ensure soil fertility.

Bayyo farmers also used sunflower (*Tithonia diversifolia*), which was considered as a weed because of its abundance, for soil fertility management. During the land preparation for rice cultivation, sunflower cuttings were applied in the paddy fields for slow decomposition. Indeed, the community in Bayyo showed innovativeness and resourcefulness in their farming system with the use of available natural resources for the sustenance of their production system (Magcal-a-Macandog and Ocampo 2005).

Akin to numerous IPs in the Philippines, the swidden-based culture of the Iraya Mangyan in Mindoro reflected the extensive indigenous knowledge of the tropical ecosystem. Their traditional kaingin system was in harmony with the natural processes of the forest ecosystem. Consequently, the system aimed to revert these cultivated lands to forests for the overall maintenance of the ecological balance. In choosing the field for kaingin, flora composition of the area was examined to determine its soil properties. The indigenous community would normally conduct the farming practice away from the headwaters of streams to protect their water sources. Prior to the burning, firelines were created to prevent the spread of fire to the entire forest. Big trees within the field were also covered with *saha ng saging* (banana trunk) to protect them from intense heat. With the use of stones and bamboo, these materials were rubbed against each other to produce fire that would start from the top of the trees and down to the lower portions of the field to prevent the upward spread (Panegro and Bulatao 2002).

Further, the kaingin system of the Iraya opened up small swidden plots surrounded with forest vegetation to imitate the natural biodiversity of the area. Various crops with different planting and harvesting seasons were planted to mimic the canopy layer and underground layer of the roots. Diverse root systems of trees and agricultural crops also served as a preventive measure against soil erosion. As regards forest regeneration, coppicing of tree stumps and seed dispersal from the adjacent forests were employed to hasten the regeneration during the fallow period. Essentially, the careful spatiotemporal manipulations done by the Iraya people portrayed a balanced resource extraction coupled with conservation and maintenance strategies to ensure the sustainability of the forest ecosystem (Panegro and Bulatao 2002).



The traditional farming methods of the B'laan, T'boli, and Tagakaulo in Mindanao also portrayed a human-environment connection. Both B'laan and T'boli farmers developed their own planting calendar based on the constellations. For B'laan, the signal for the start of the planting season was the appearance of the *samkyab* and *tubong* stars in the sky, while the T'boli

looked for a specific arrangement of the stars called *blotik*. A sign of two stars in the northeastern direction was the planting basis of the T'boli. However, if these stars were directly overhead, the different communities would interpret the positioning as a bad omen, thus preventing them from planting. Unlike with the previously mentioned IPs, these Mindanao indigenous communities employed a zero-tillage method in farming. Conical holes were dug by men during the planting while the women filled the holes with soil through a single sweep of the foot. This process prevented seed contamination and aided in the germination due to minimal soil disturbance. Throughout the year, a minimum of three rice varieties were planted for each planting season to ensure the seed diversity, prevent pest infestation, and assure seed viability (Zapico et al. 2015).

The presented accounts of the IPs depicted their mutual relationship with nature. Their practices elaborated a rich human-environment interaction that was perfected through time, resulting in advanced modes of resource extraction that were in harmony with the earth's natural processes. Yet the economy in precolonial Philippines remained domestic in nature despite their increasing engagement in marketing activities both locally and overseas (NCCA 2000). In precolonial times, the Philippines was still covered with thick dipterocarp forests, together with molave-narra forests in areas with pronounced dry season and shallow limestone soils, pine forests, and mossy forests in the Cordilleras, Zambales, and Mindoro islands, and beach forest including mangrove swamps (Pulhin, Amaro, and Bacalla 2005).



### **Birth of the Anthropocene: Colonization and Industrialization**

In the Age of Discovery or the Age of Exploration,<sup>5</sup> the “civilizing missions” of western countries paved the way to the exploration of the world, which was driven by their will to gain more power, territorial expansion, and control over the natural resources of eastern countries (Heffner 1918). When the Spanish colonizers arrived in 1521, the country was covered with approximately 27 million hectares (see Figure 1) of tropical forest (Lasco, Visco, and Pulhin 2001). From the communal form of land ownership, the colonizers claimed sovereignty and authority over these lands through the Regalian Doctrine which favored them and a few local elites.<sup>6</sup> These policies impeded the rights of the indigenous peoples to own and cultivate their lands for subsistence, thus leaving them landless and squatters in their own country (Lynch 1986). At first, these colonizers were not much concerned with the commercialization of timber; instead, it was utilized for shipbuilding in support of the galleon trade<sup>7</sup> during the mercantile era.<sup>8</sup>



**FIGURE 1.** Changes in Forested Area in the Philippines, 1575–2015 (in million hectares)  
(Boado 1988; DENR–FMB 1998, 1990, 2004, 2010, 2015)

In the mid-nineteenth century, the Spanish colonial administration seized the opportunity to sell timber in Spain and other foreign markets. Depletion of timber during this period compelled the government to create the Inspección General de Montes, or Forest Service, which had the control, ownership, and administration over forest resources (Top 2003). Its strict regulation of forest use, the prohibition of unauthorized encroachment, illegal cutting of timber, and the banning of kaingin or shifting cultivation increased the marginalization of IPs (Makil 1982). The widespread implementation of *encomienda*<sup>9</sup> over the traditional kaingin led to the clearing of molave-narra forests in Cebu, Bohol, and Ilocos Region (Pulhin et al. 2005). Agricultural expansion in these areas increased because of the high demand for agricultural crops from the newly industrialized countries, thereby shifting from being a subsistence economy to a world-market economy.

At the start of the twentieth century, shortly after the United States colonized the Philippines, the country's forested area decreased to around 70 percent or 21 million hectares (Lasco et al. 2001). Although most of the laws and policies were retained, such as the Regalian Doctrine, changes in the administration were made to develop the potential of the country's natural resources, including the extensive and still largely virgin forests. The Inspección General de Montes was replaced by the Forestry Bureau through General Order No. 50 on 14 April 1899 (Makil 1982). With the legislation of the Forest Act of 1904 and the Forest Law of 1917, the Forestry Bureau retained the power to classify land into private and public domains.

It was during this time that the Americans envisioned the industrialization of the Philippine forestry sector. Though it may seem successful because the country became Southeast Asia's largest exporter of timber, the system was

designed to benefit only the colonizers and the allied local elite (Pulhin 1996). In fact, 662 timber licenses and 10 companies were permitted to harvest 2,831 m<sup>3</sup> of timber between 1 July 1901 and 30 June 1902. The increasing demand for timber in the international market generated more profit for the major investors but caused an increasing deforestation rate.

Moreover, the forest condition worsened when scientific forestry was reinforced by the Americans to train local people in adopting the western concept of forest management.<sup>10</sup> Embracing this concept required the locals to set aside their indigenous knowledge on harmony and sustainability with nature in exchange for the western concept, which prioritized production on the basis of economic demand in the international market. Americans established research facilities that focused mainly on determining the properties and uses of selected tree species in support of the newborn wood industry. Instinctively, this “scientific forest management” inculcated timber as the major forest source while disregarding the significance of other “minor forest products” (Pulhin 1996). The gap between humans and the environment widened with the application of this new management, neglecting the traditional management that is anchored in environmental protection and care. Indeed, Bedard and Ylvisaker brilliantly assessed the reality of advanced forest management of the Philippines consistent with the western concept of management:

The history of the utilization of Philippine forests is unique among Southeast Asian countries and probably unique in the entire tropics, in that exploitation developed more rapidly and with a higher degree of technical efficiency than in other similar areas. For this situation, the American occupation is probably responsible. American entrepreneurs entered the Philippine forests, bringing with them mechanized logging techniques largely from the Pacific Northwest of the United States. Philippine enterprises developed on the American model so that today Philippine exploitation techniques are the most technically advanced in the Asiatic and Pacific tropics. (1957, 7)

The introduction of modern logging practice supported the modernization and degradation of the forest. The American Insular Lumber Company, a 20-year renewable concession covering 30,000 hectares in Northern Negros, could produce 30 cubic meters of dipterocarp lumber per hour (Poffenberger and McGean 1993). In the 1940s American firms held 41 percent of investments for the sawmill industry, while 34 percent were owned by the Filipino elite, and the remaining 25 percent were owned by other foreign investors. Likewise, the issuance of mining permits and the enactment of Forestry Administrative Order No. 14-1,<sup>11</sup> which allowed agricultural expansion, compounded the state of forest degradation (Pulhin, Amaro, and Bacalla 2005). It was during this time that deforestation became more evident, but the Americans attributed the forest cover loss to the

kaingin practices of the indigenous and immigrants instead of their large-scale mechanized logging operations (Top 2003).

During the Japanese occupation in 1942, all districts and forest stations in the Philippines were still in operation. Rapid severe deforestation and devastation in the forest industry were recorded because of the exploitation of forest resources for war purposes (Pulhin 2002).

### **Great Acceleration: Degradation in Modernization**

The aftermath of World War II left behind a desolate landscape of destroyed houses, devastated agricultural lands, and degraded forests. To support the macroeconomic policy toward industrialization, the forestry sector liquidated its forest resources into solid capital to stimulate economic development (Boado 1985; Quintos 1989). Increasing demand for tropical timber in Japan and the United States resulted in the issuance of more Timber License Agreements (TLAs) necessary to accelerate industrialization in the forestry sector.

During the Marcos martial law period, abuse of the Regalian Doctrine became more apparent as the president issued more TLAs to his favored logging concessionaires and even distributed “special cutting permits” to his cronies. As for his political enemies, most of their TLAs were canceled, not renewed, or suspended (Vitug 1993). The licensed area included 10.59 million hectares, which is more than twice the area in 1959, with an annual allowable cut of about 11 million cubic meters. This means that one-third of the country was more subjected to degradation because of this “legal” exploitation. Most of the logging concessionaires chose log exportation over wood processing as preferred by the licensees, since the former requires minimal capital outlay and has faster cash turnover (Pulhin 1996; Pulhin, Amaro, and Bacalla 2005). Since most of these licenses covered only a short period, many concessionaires ruthlessly harvested beyond sustainable limits and immediately escaped to look for other areas to exploit. Sadly the prevailing system benefitted only a few elites, mostly composed of politicians and well-connected individuals, thus stagnating the majority of the Filipinos to poverty and inequality.

The sudden boom of the logging industry benefitted the national economy as it geared toward industrialization. During its peak, 27 percent of the country’s foreign exchange came from forest products. Notably, freedom from colonizers and a more stabilized government greatly influenced population growth, and the abrupt population increase added to the surging demand for food and other basic needs. With this, the increased accessibility to forests paved the way for its increased exploitation through intensive agriculture, kaingin, and illegal logging. About 60 percent of forest denudation coming from extensive kaingin<sup>12</sup> farming applied in logged-over areas and brushland was recorded, while 30 percent of denudation was accounted for intensive agricultural expansion (Pulhin, Amaro, and Bacalla 2005).

The inculcation of the Filipinos became a catalyst for change in the human-environment interaction, which led to massive destruction of the

forest. Indigenous peoples were forced by the colonizers to settle in the most inaccessible areas within the mountains. Consequently, those who were left under the rule of the colonizers were obliged to embrace their hostile approach toward the environment. Domination of the foreign culture suppressed the indigenous culture, invading the minds and lives of majority of the Filipinos. Subsistent use of natural resources shifted to its commoditization to support economy-driven extraction that is fueled by the country's pursuit of industrialization specifically after World War II (Box 1).

While it can be assumed that the colonizers were the strong forces behind the economic shift, the broader reason behind the pursuit for industrialization was the pressure brought by the global trend during the Great Acceleration.<sup>13</sup> Economic growth, which was almost synonymous with industrialization, was expected from the less-developed countries. Based on the growth-oriented paradigm from the West, the industrialization of the forestry sector became a catalyst for economic growth. One of the greatest influences of that time was the advocacy of Jack Westoby (1962) expressed in his book *The Role of Forest Industries in the Attack on Economic Underdevelopment* summarized in this central idea:

Forests are a most important asset of a country's wealth—an asset that every poor country possesses or could possess—for they provide a renewable raw material for a whole range of industries which have acquired great importance in many industrially advanced countries. This asset is very often neglected in less developed economies, or exploited only as raw material for export.

Unfortunately for the Philippines, the industrialization of the forestry sector was economically limited, short-lived, and sociopolitically and environmentally damaging.

In essence, the multifaceted history of forest destruction and degradation in the Philippines proved how the intensity and longevity of human activities could progress into something that could alter the forest and its functioning. The tremendous forest cover decrease shown in Figure 2 depicts the severity of colonization and its impact toward the forestry sector. Commoditization and primacy of timber resources over non-timber forest products manifested the inculcation of the Filipinos. Further, its persistence even after the colonization proved the intensity of the change brought by the foreign countries and the level of adoption of the Filipinos. Unfortunately, this also revealed how the indigenous knowledge systems and practices (IKSP) were undermined by this new culture that was indifferent to nature and its processes. Indeed, colonization coupled with the global forces on industrialization, globalization, and modernization compelled the Philippines toward the path of the Anthropocene.



## From Destruction to Conservation: Evolution of Forest Policies

In the history of forest destruction and degradation, it can be understood that the Anthropocene is not merely concerned with the physical alterations in the environment, but mainly with the changes in human-environment interaction. More than the impacts on the biogeochemical cycles of the earth, the invasion in the minds and lives of the Filipinos should be the greater concern.

### BOX 1. CHAIN REACTION: FROM COLONIZATION TO IP MARGINALIZATION, THEN SHIFT IN RESOURCE EXTRACTION

The intricacy of indigenous people's resource extraction schemes reflect the coupling of social and environmental systems, which posed little or no compromises on the biogeochemical functioning of the earth. Perfected through time, these manipulations allowed them to maximize the potential of their environment for the provision of their basic needs and the maintenance of harmony. Indigenous knowledge systems and practices (IKSP) such as the payoh-pinugo system and kaingin practice are a few of the acknowledged sustainable traditional practices attained not through scientific advancements, but rich experience with nature (Camacho et al. 2016; ILO 1995; Panegro and Bulatao 2002). Looking at the Philippines and the status of the forest today, an enormous gap can be found between the previous and the current manner of resource extraction. Evidently, the country's history of colonization did not only encroach upon Philippine lands, but also upon the identity, culture, and minds (ADB 2002; Buendia 1993) of Filipinos—with long-term consequences leading to the Anthropocene.

During the Spanish period, most indigenous peoples such as the Tagabukid of Sibuyan, who used to settle in the lowlands, chose to escape from tuga (forced labor) and fled to the inaccessible areas within the mountains. Likewise, the Igorot people of the Cordillera resisted strongly against the colonial forces to secure their people and lands. Since the colonizers couldn't overpower the indigenous peoples, they seized this opportunity to inflict division among the Filipinos by labeling them with derogatory names.

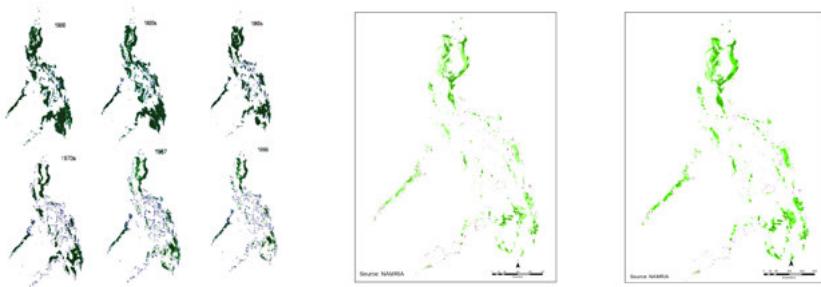
For instance, the Tagabukid were identified as “mangyan,” “mangyas,” or “manguid,” which means “illiterate,” “unclean,” “liar,” and sometimes, “criminal.” Shortly after, even the indios internalized these prejudices toward the indigenous peoples, which resulted in the dichotomy between the assimilated majority and unassimilated minority, thus igniting one of the major problems that persisted through time—the marginalization and discrimination of indigenous peoples (ADB 2002; de Guzman and Dinopol 1997).

Discrimination against non-Christian IPs continued as the new colonizers, the Americans, adopted the racist tribal policies of the Spaniards. With the booming logging industry, the American entrepreneurs saw the potential of the peaceful and hardworking “mangyan” people of Mindoro as a labor force for the large-scale logging operations on the island. With this, the Mangyan were alienated from their ancestral domains and were displaced to the hinterlands. This process was similar to what these American entrepreneurs did with the Native Americans: after claiming the lands of the natives, they unscrupulously harvested the timber in the area. Subsequently, armed men during the Japanese period invaded the Iraya people of Northern Mindoro, forcing them to live in the upland areas. In the 1950s, the quiet life of the Iraya was interrupted because of the encroachment of loggers, cattle raisers, and lowland farmers who exploited their natural resources (Panegro and Bulatao 2002). It was during this period that the criminalization of kaingin practice of the indigenous people occurred—widespread deforestation and degradation were associated with kaingin to conceal the massive destruction brought by the mechanized logging companies.

Even after the colonization period, denial of the rights of the IPs on their ancestral domains continued to persist with the enactment of Presidential Decree No. 705 or The Forestry Reform Code of the Philippines, which stated that “no lands of the public domain with a slope of 18 percent or more which have already been classified as alienable and disposable shall be reverted to the classification of forest lands . . . to form part of the forest reserve . . . that when the public interest so requires, steps shall be taken to expropriate, cancel effective titles, reject public land applications, or reject occupants thereof” (Official Gazette n.p.). Despite the continuance of the Regalian Doctrine in the current 1987 Constitution, enactment of the Indigenous Peoples Rights Act (IPRA) in 1997 clearly elaborated the recognition and promotion of the rights of the indigenous people/Indigenous Cultural Community (ICCs) within the framework of national unity and development, including their rights over the ancestral lands to ensure their economic, social, and cultural well-being. Unfortunately, the intended benefits of this law have not yet been fulfilled and experienced by most IPs. Numerous conflicts on unlawful encroachment, misinterpretation of laws, undefined boundaries, and overlapping programs are some of the challenges to the implementation of the IPRA Law.

The history of discrimination and marginalization of the IPs from the period of colonization impacted the transfer of culture from one generation to another.

This tragedy is called psycho-cultural marginality, or the loss of one's cultural identity along with social and personal disorganization. The inhabitation of the IPs also denied its people access to traditional culture, values, and norms that led to historical trauma and cultural alienation. Inaccessibility of indigenous culture made it easier for western culture to creep into the minds and lives of the Filipinos (Cruz 2019). Inculturation of the IPs led to the alteration of their human-environment interaction, since their culture was highly tied to their environment. From sustainable and subsistence resource extraction, colonization and industrialization influenced capitalistic resource extraction in the Philippines. Likewise, the market-driven economy led to the primacy of timber over the so-called minor forest products. Continuance of timber extraction even after colonization reflected the domino effect of the inculturation. Consequently, it continued to belittle the non-timber forest products that essentially provided the basic needs of the IPs and kept the ecological balance prior to the colonization period.



**FIGURE 2.** Changing Forest Cover of the Philippines (DENR-FMB 2000; NAMRIA 2010–2015)

Underneath all the changes in the environment and manipulations of the mind are the laws and policies that influence these changes. Policies and laws are principles that guide the decisions to achieve the desired outcome (Jili'ow 2017; Rebugio 1995). Their conceptions are intertwined with social, economic, political, and cultural contexts enveloped with the influences from historical trends and global processes (Rosa et al. 2015). On the other hand, the interconnection among man, environment, and policies can also be used for the conservation of forests amid the driving forces of colonization, industrialization, modernization, and commoditization. Scrutinizing the different periods in Philippine history also reveals the evolution of beliefs, commitments, values, visions, and wisdom of the Filipinos as reflected by the governing laws and policies and its impact on the environment.

Customary laws of different cultural communities in the Philippines before colonization embodied the intimate connection between man and his environment. Laws laid the foundation for justice, unity, and peace within the communities. They are the by-products of the indigenous forestry knowledge

system that encompassed local technologies, innovations, know-how, skills, practices, and beliefs. In general, the engagement of the IPs with the spiritual realm led them to manipulate and utilize their natural resources with high regard. They understood that impairment of nature due to destructive practices could also affect their lives (Cola 2002). For instance, the Ifugao implemented tribal laws for the protection of their natural resources (ILO 1995). Illegal practices such as extensive cutting of trees in the muyong were given penalties. Communities who practiced kaingin also penalized and punished those who caused widespread fires resulting in extensive destruction of the forest and its resources (Panegro and Bulatao 2002).

Another noteworthy case is the multiplicity and ingenuity of the customary laws of the Tagbanwa people in Palawan, which ensured the sustainability of natural regeneration capacity and conservation of biodiversity. Anchored on the belief regarding oneness of physical, social, and spiritual worlds, every member maintained harmony with nature despite their resource extraction. Their extraction processes followed five principles with which their strategies and practices aligned:

1. **Waste prevention.** Ensuring the use of all harvested resources to avoid wastage, thereby promoting resource sharing among the community.
2. **Precautionary management.** Preventing or mitigating adverse impacts and ensuring that natural processes are not disrupted in their resource extraction.
3. **Sustainable harvesting.** Avoiding depletion of the supply and disturbance of natural regeneration capacity.
4. **User's payment arrangement.** Compensating other potential resource users higher for greater forgone extraction opportunities.
5. **Natural pattern preservation.** Avoiding adverse impacts to the environment. (Cola 2002)

However, a sudden shift in the human-environment relation occurred as the colonizers invaded not only the country's territory and resources, but also its legal system. The colonizers introduced a new value system which is different from the customary laws of the IP. The previous legal system evolved in conformity with the new legal system, which regrettably affected the behavioral pattern of Filipinos, including their concept of right and wrong (Cola 2002).

In the early days of Spanish colonization, the implementation of the Regalian Doctrine institutionalized the Spanish Crown's ownership of all lands, including their natural resources. The Crown issued royal decrees providing instructions for the management and use of the forest. It can be observed that the colonizers had three pronounced areas of concern for forest policies: 1) provision of timber for Spanish civil and naval needs; 2) generation of government revenue; and 3) perpetuation of the forest resource. The legalization of the land ownership was also implemented, superseding

the communal land ownership of the IPs. The change in the system negatively affected the IPs as their commitment toward forest protection and management began to wane (Pulhin 1996, 2002; Pulhin, Amaro, and Bacalla 2005). The encomienda system, which is a labor and tribute system, added up to the oppression of the natives. This caused estrangement of the common Filipino from the elites because of the latter's abusive powers. (Anderson 1976; Teodoro 1981). The establishment of the Inspeccion General de Montes (IGM) legalized the control, ownership, and administration of forest resources. Strict regulation and prohibition of unauthorized encroachment in forestlands, illegal cutting of timber, and the practice of kaingin were also implemented (Pulhin 1996). The IGM served as a license to reprimand IPs for practicing their way of life, particularly resource extraction that is mainly for subsistence.



The American occupation brought multifaceted alterations in the country as the Americans sought to industrialize and modernize the forestry sector. Through policies and laws, the colonizers were able to legalize the exploitation of natural resources. The Regalian Doctrine was retained followed by the enactment of the Philippine Act of 1902, which reinforced the public ownership of unclassified and untitled lands. By 1903, the Public Lands Act specified the land classification system wherein Alienable and Disposable Lands could be privately owned, while Public Lands remained to be owned and managed by the government (Top 2003). After classifying the lands, the Forest Act of 1904 was implemented to encourage rational exploitation of forests by installing an appropriate regulatory environment to prescribe fees and taxes, and to define parameters for the conversion of forest land to agriculture. This law served as the decisive regulatory mechanism of Philippine forestry and the basis of all elements of forest management (Pulhin 2002; Pulhin et al. 2005). The Act granted corporate access to public forest through Timber License Agreements (TLAs), which "provided the right to utilize forest resources within any forest land without any right of occupation or possession over the same, to the exclusion of others except the Government, but with the corresponding obligation to develop, protect and rehabilitate the same in accordance with the terms outlined in said agreement" (Boado 1988).

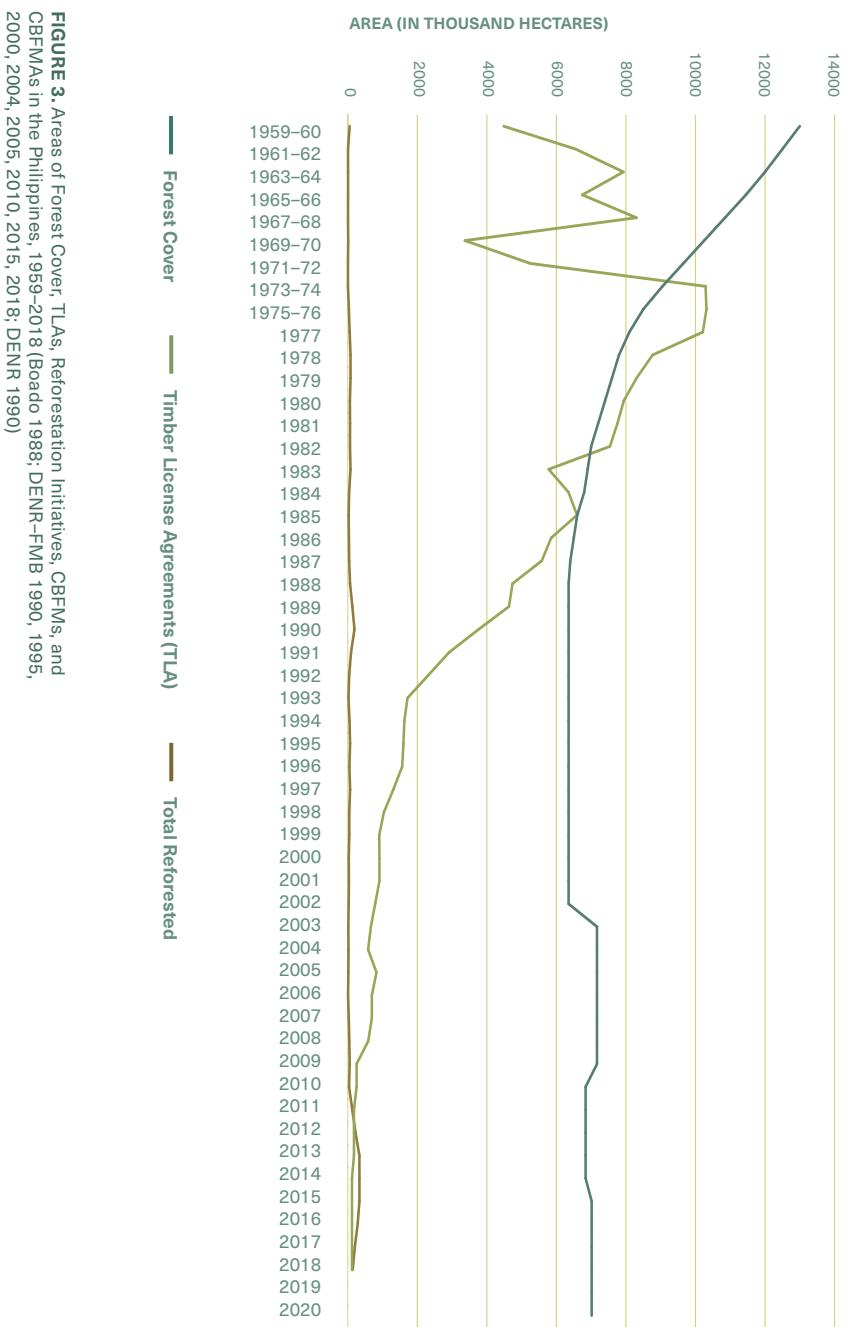
With the introduction of mechanized logging and the issuance of numerous TLAs, more virgin forests were exploited and age-old trees were harvested. Mining permits were also issued, resulting in the destruction of many public forestlands. Logging and mining operations unintentionally provided entry to these inaccessible areas, giving way to agricultural expansion and kaingin (Pulhin 1996; Pulhin, Amaro, and Bacalla 2005). In 1917, the public forest of the

Philippines was “held and administered for the protection of the public interest, utility and safety of the forest, and the perpetuation thereof in productive condition of wise use” (Hyman 1983). Although Philippine mahogany<sup>14</sup> found fame in the international market and a large sum of money was earned from its sale, forest conservation and sound management were almost lost.

The postwar era confronted the country with pressures to restore itself from the ruins while accelerating toward industrialization and modernization. Since the international demand for Philippine mahogany was still quite high and remnants of trees were still available for exploitation, the government seized the opportunity to liquidate the forest resources to solid capital for economic development. In addition, the elite managers of TLAs expanded their production and consumption to hasten their return on investment (see Figure 3). Considering that timber harvesting involved exploitation of natural resources and the use of mechanized logging equipment, it is no surprise that it led to pollution and forest denudation. The treadmill of production theory (TOP) as proposed by Allan Schnaiberg (1980) clearly depicts how social forces influence human pressure on the environment consistent with the desire for economic growth and modernization. The basic argument of this theory is that,

at least since World War II, “producers” (i.e., the owners of the means of production, such as factories) and elite managers, especially corporate leaders, have sought production and consumption as rapidly as possible to increase profits . . . Similarly, governments support growth because it generates tax revenues, which allow those in government (who are often social elites connected to corporate power) to implement policies and programs aimed at fixing the problems that economic growth itself has generated, such as pollution and unemployment. Thus, economic growth generates environmental and social problems, and those in power push for further growth to solve these problems in an ongoing “treadmill” . . . [TOP argues] that contemporary capitalist political economies promote economic growth, prioritizing it over concerns about social inequality and environmental protection. (Rosa et al. 2015)

To support the growing timber industry, the government implemented policies and programs that would maximize the profit in timber harvesting. For example, the provision in Article 13, Section 1 of the 1935 Constitution stating that all timber lands “belong to the State” became the guiding principle for the proliferation of more timber licenses (Pulhin 1996). The issuance of TLAs peaked during the Marcos regime as he centralized the control of these economic resources to a few traditional elites, mostly composed of his friends and family. Marcos also used the TLAs to reward his supporters and his political allies obviously as a mechanism to maintain political power and control. The President’s relatives, few elites and cronies owned large-scale logging companies that earned millions from logging exportation. It was also during



**FIGURE 3.** Areas of Forest Cover, TLAs, Reforestation Initiatives, CBFMs, and CBFMAs in the Philippines, 1959-2018 (Boad 1988; DENR-FMB 1990, 1995, 2000, 2004, 2005, 2010, 2015, 2018; DENR 1990)

this time that land-grabbing and privatization became prevalent; thus, his allies were favored while the upland communities including the IPs were oppressed (Vitug 1993). Unfortunately, this period also recorded the greatest decline in forest cover with the highest rate of forest destruction. In addition, there were also rampant corruptions within the system. The extremely low forest charges imposed by the government for forest exploitation were not enough to provide for forest management and renewal. The low forest charges possibly stimulated corruption and bribery, since high profit margins encourage the TLA violators to bribe their way out, considering that it's cheaper for them to do so instead of complying with existing rules and regulations (Pulhin 1996).

To lessen the possible negative repercussions of excessive harvesting, the Philippines enacted laws and programs that promoted sustainable use of the forest resources based on the scientific forest management taught by the Americans. In 1954, Forestry Administrative Order No. 23 recommended that logging operations in areas classified as permanent forest should be under the sustained yield management. The Selective Logging System to the Philippine dipterocarp forest, as explained in Box 2, should be implemented in the said areas. This order was followed by administrative orders, directives, memoranda, and circulars consistent with the promotion of selected logging and sustainable forestry. Correspondingly, a *Handbook on Selective Logging* commonly known as the "bible of Philippine forestry" was published by the Bureau of Forest Development (BFD) in 1995. The book contained the rules and regulations for the implementation of selective logging together with the related memoranda and circulars. P.D. No. 331, Series of 1973 strongly prescribed sustained yield as the basis for the development, management, and utilization of all the country's public forests. Likewise, Presidential Decree No. 705 or the Revised Forestry Code of the Philippines issued in 1975, together with its amending decrees reiterated the implementation of selective logging as the silvicultural and harvesting system for dipterocarp forests, thus promoting sustained-yield forest management (Pulhin 1996).

In spite of the sound laws and policies and advancement of scientific forest management, failing to actualize sustained yield in forest management was inevitable. Most of the local specialists concluded that the main deficiency of the system was its failure in the implementation phase. The failure was associated with the prevailing political and economic orientation of the concessionaires from its implementation in the 1960s. It is indeed true that there were constraints in the technical aspect of sustained yield forest management, but still, the political, economic and social influences were more important (Pulhin 1996). As elaborated by Uebelhör, Lagundino, and Abalos:

During the time (1960–1980s) which saw the largest conversion of virgin into logged-over forest (approximately 4 million hectares) the legal and political climate was not conducive to sustainable resource management. The government lacked the political will and the administration did not

show the necessary determination to control and to enforce the rules and regulations which they had given themselves. Concessionaires entrusted with the management of the country's forest were not induced to comply with the existing rules and regulations because of the doubtful security of tenure of their operations, the absence or unlikeliness of control and the easiness with which an increasing number of indifferent officials could be "convinced" to ignore violations. (1990, 36)

#### **BOX 2. PHILIPPINE SELECTIVE LOGGING SYSTEM (SLS) AND ITS IMPACT ON THE PHILIPPINE FORESTRY SECTOR**

Although the western concept of forest management varied greatly from indigenous knowledge systems and practices (IKSP), its strength on scientific management resulted in the conception of the Philippine Selective Logging System (SLS). It was a system of harvesting appropriate for uneven-aged tropical forests which also served as a forest protection strategy for diverse flora and fauna species. The government leased a large tract of public forest land to a logging company for 25 years, allowing them to remove the mature, overmature, diseased, and defective trees, leaving behind an appropriate number and quality of residuals for the continuity of ecological services, such as soil and water conservation. This process provided an opportunity for the climax stands to be converted to more productive forests, as the harvesting opened adequate spaces for forest regeneration.

Technical guidelines were given to ensure the sustainable management of the forests and to maximize the growth and yield rates of the premium timber species. After the first cutting cycle, it was assumed that the forest will be left for 30 to 40 years to give ample time for its recovery/regeneration. The whole concession area was divided into different portions that were scheduled to be cut yearly. Accurate calculations of the volume of timber to be extracted were necessary to ensure that the regenerated forest stand would be ready for the second cutting cycle at the end of the licensure agreement. This system covered three phases of forest management: establishment, tending, and harvesting, including the protection of the logged area.

Conversely, the sophisticated SLS hardly materialized on the ground because most often, the concessionaires would just choose to pay the meager penalty price instead of spending more money and resources on reforestation. Short-sightedness of these concessionaires prevented them from planning for a sustainable logging system. Evidently, they were more concerned with earning easy money from the forests and leaving them degraded. Another factor was the inconsistency of the government in implementing the law. Other government sectors were powerless during these times because of the monopolized power possessed by President Marcos, therefore no cancellation of TLAs was given to his allies and cronies (Vitug 1993).

On the other hand, the experience of the Surigao Development Corporation (SUDECOR) gave a glimmer of hope on the possibility of timber harvesting of residual forests in a sustainable manner. Since 1965, the company implemented sound forest management and development practice consistent with the prescribed laws, rules, and regulations, particularly the SLS. Their consistent compliance resulted in the maintenance and protection of one of the best growing stocks of naturally regenerated dipterocarp forests in the Philippines. Based on SPOT satellite imagery, 90 percent of the concession area was mantled with green tropical forest vegetation. Production zone accounted for 51,570 ha, or 68 percent adequately stocked production zone. Though their compliance with the 1992 government policy banning the logging of old-growth forests restricted their operable residual forest to only 36,216 ha, this proved that the company maintained a vast tract of old-growth tropical forests, with a quite profitable harvesting area on well-stocked secondary forests. Further, the company incorporated biodiversity measures to ensure the sustainability of the production system prior to the cutting operations. The annual allowable cutting area was only 1,035 ha with only 65,770 m<sup>3</sup> of annual allowable cut, thus only 10–20 matured trees per hectare with a merchantable size of at least 60 cm DBH (diameter at breast height) could be harvested. SUDECOR adopted the 35-year cutting cycle (harvesting in a particular portion every 35 years only) that gives adequate time for the regeneration of the area. In terms of the protection zone, the company allocated the 24,192 ha, or 32 percent of the total forest concession to ensure that the integrity of the forest including its ecological services was maintained (Durst et al. 2005; SUDECOR 2017).

Sadly, contradicting policies like the enactment of Executive Order No. 23, which ordered a total log ban across the country, forced the shutdown of SUDECOR's operations. Due to frequent flooding incidents in Mindanao, the government implemented the ban to stop illegal logging operations. Ironically, only legal logging operations were halted, while illegal logging and both large-scale and small-scale mining persisted in the residual dipterocarp forests, sub-marginal forests, and even in the proclaimed watershed reserves. Evidently, the log ban has led to more forest cover losses without any clear mechanisms for sustainable forest management (SUDECOR 2017).

Moreover, the Paper Industries Corporation of the Philippines (PICOP), which operated in 1963, was the only fully integrated pulp and paper mill in Southeast Asia. It achieved and developed its expertise in wood technology and paper manufacturing and was acknowledged worldwide for the high quality of their exported plywood, veneers, and logs. Locally, it provided paper products such as newsprint, kraft linerboard, corrugated medium mechanical paper, and telephone directories. PICOP was also known because of its Livelihood Enhancement Agro-forestry (LEAF) Program that encouraged many private landowners and farmers to develop their land for food and fuelwood production. The program was designed to enhance the socioeconomic conditions of the private landowners and farmers. At the same time, it was a

counteract measure for the destructive kaingin practiced by the farmers along the sloping and rolling lands. In 1980, almost 3,800 landowners and farmers participated in the program because PICOP served as a technical partner and buyer of pulpwood to the farmers, hence providing a direct and secure market for the harvested timber (Casiro and Catubig 2019).

PICOP was also engaged in the Modified Social Forestry Program with the kaingineros and forest squatters who entered the concession area on or before 31 December 1981. Kaingineros and forest squatters were considered as "Tree Contract Growers." They planted ipil-ipil (*Leucaena leucocephala*) and falcata (*Albizia falcata*) at one hectare per month within the 10-hectare lot allocated to them. The company gave them free seedlings and allowed them to interplant cash crops and fruit trees, provided that the pulp tree was still growing. They also encouraged poultry and livestock raising. PICOP also paid the tree growers for their services and gave them the priority to harvest the trees for free upon reaching the rotation age of eight to ten years. Above all these, PICOP was committed to the implementation of sustainable and ecological forest management practices without neglecting the goal of improving the socioeconomic status of the communities that surrounded the concession area (Casiro and Catubig 2019).

However, the company was forced to shut down in 2006 because of entangling concerns on both external and internal problems such as natural calamities; national economic and political instability; high fuel costs in the international market; unfavorable national market conditions due to market globalization; subtle effects of full privatization; the emergence of poachers, smugglers and other illegal log buyers within the concession area; and legal and environmental constraints (Casiro and Catubig 2019).

From the theoretical and empirical perspective, SLS exhibited the role of silviculture and applied forest science in pursuing sustainable forest management that could satisfy the needs of this current generation without compromising the ability of the next generation to utilize and enjoy their natural resources. Although PICOP elaborated on the various reasons for its shutdown, it can still be observed that for both SUDECOR and PICOP, policy interventions directly affect not only the violators, but also the compliant institutions. Hence, it is imperative to carefully think of policy interventions, implementation, and future trajectories because they have the greatest capacity to shape and realign the path that the Philippine forestry sector is now taking.



### **Shift toward Community Forestry and Forest Conservation**

Overwhelming global pressure on industrialization led the Philippines to pursue economic development regardless of the environmental consequences that it entailed. The industrialization model of Westoby (1962) became the blueprint for development, elaborating the various economic growth stages that should be attained by developing countries. The model was also associated with the “top-down approach,” which assumed that the development in the forestry sector through industrialization will result in the diffusion and multiplication of developments to the other sectors of the economy. In reality, this strategy distilled little effects to developing countries while incurring greater benefits to the developed countries because of the continuous supply of forest products for the latter (Pulhin 1996).

Shortly after its implementation, the global arena was struck because the intended economic growth of the developing countries through the “top-down approach” failed to materialize. Likewise, the perceived trickle-down effect of socioeconomic benefits to the other sectors of society, specifically the rural poor, did not happen. In fact, most of the developing countries were left with degraded forests and with little or no economic development. Poverty became a widespread problem in these countries, which aggravated their current scenarios. On one hand, the 1976 report of the World Employment Conference argued that poverty problems in the developing countries could be alleviated not by the “abandonment of growth as an objective” but through the “redistribution of growth.” This approach suggests the prioritization of the poorer groups in terms of development investments. With this, a shift in the development thinking took place to focus more on the redistribution of the benefits of growth directed to the poorer groups. Development projects in the rural sector focused on increasing the productivity of small farmers and the self-employed through the improvements in the access to land, water credit, markets and other facilities (Chenery et al., 1974). Subsequently, the Geneva-based International Labour Organization (ILO) popularized the “basic needs approach” in support of these prevailing concerns. This approach prioritized the fulfillment of people’s basic needs, including non-material needs, at the shortest possible time and the concrete specification of poverty to combat it through public service (Pulhin 1996).

Locally, the global concern about Redistribution with Growth motivated the Philippine government to redirect its steps. Various programs on forestland occupancy for the upland communities were stipulated in Presidential Decree No. 705, or The Revised Forestry Code of the Philippines. Some of the most prominent programs were Forest Occupancy and Management (FOM) in 1975, Communal Tree Farming (CTF) in 1978, and

Family Approach to Reforestation (FAR) in 1979 (Pulhin, 1996). Similarly, the emergence of community forestry as a new approach highlighted the role of social equity, poverty alleviation, and resource sustainability in rural development through a people-centered development. From the perspective of rural development, environmental stability through the maintenance of tree cover was equally important to meet the basic needs of the people. At the center of this approach was the community—people who were unable to express their needs as an effective economic or political demand, but as only the forest's. It sought to provide direct benefits of the forest to rural people (Pulhin 1996).

Thereafter, these programs were consolidated to one: the Integrated Social Forestry Program (ISFP) through the Letter of Instruction No. 1260 issued in 1982. This program primarily aimed to “democratize the use of public forestland to promote more equitable distribution of forest bounty.” It officially adopted social forestry as a forest management and development strategy in the Philippine uplands. There were three primary goals for this program: (1) to decrease forest destruction by shifting cultivation, (2) to fight poverty among forest occupants, and (3) to help in the rehabilitation of the forest (Pulhin 1996).

However, it was argued that the implemented social forestry was just the surface of a bigger political agenda of the government: the program was actually part of the overall rural development counterinsurgency strategy of the Marcos administration. Community forestry, on one hand, was the instrument used to control and stabilize intense political unrest in the countryside. Most of the social forestry programs were concentrated in areas with high insurgency problems. Similarly, the government's goal to rehabilitate the forest through reforestation projects scattered all throughout Marcos's term was in opposition to the continued rampant commercial extraction of timber by the TLA holders (Pulhin 1996).

By this time, the global paradigm shift on development approaches gradually influenced the Philippines to adopt the new concept of sustainable development. Its conception came from the learnings in past approaches, particularly the promotion of economic efficiency during the industrialization period. As the Brundtland Report conceptualized it, sustainable development is a development approach that meets the needs of the present without compromising the ability of future generations to meet their needs. The three dimensions of sustainable development overlapped with the major roles of community forestry: First, social justice from the context of sustainable development prioritized the allocation of resources to the smallholders, particularly women. Decentralization was also recommended so that the local communities could have control over the management of their resources. The second dimension, economic efficiency, gave utmost importance to the satisfaction of basic needs of the community, highlighting the concern on poverty alleviation (because solving poverty and inequity meant solving

ecological problems and other crises, too). Finally, environmental or resource sustainability recognized the physical limits on the use of the resource base and the need to conserve and enhance these resources for future generations (Pulhin 1996).

In 1986, the restoration of the Philippine democratic government also made its way for the reconstruction of the new Constitution. Consistent with the concept of sustainable development, this constitution prioritized equitable access and distribution of benefits from natural resources (Pulhin 2002). In relation, the Aquino administration enacted Executive Order No. 192 for the Reorganization of DENR as the primary government agency responsible for the conservation, management, development and proper use of the country's environment and natural resources. Meanwhile, the concept of decentralization, people's participation, and the recognition of the sociopolitical dimension of forestry became the impetus for the subsequent policy formation. This was similarly applied upon the pragmatic realization that it was in the hands of the millions of smallholders that survival of Philippine forests would be possible. It also supports the concept of decentralization and devolution which emerged as a dominant governance paradigm with the passage of the 1992 Local Government Code.

Issuance of the Department Administrative Order (DAO) No. 22 in 1993 by DENR for the establishment of Community Forestry Program (CFP) commenced the succeeding initiatives for various people-oriented forestry programs and projects. Basically, CFP aimed to initiate community-based forest development and utilization of natural resources and protect the remaining primary forests in partnership with the local community (Sajise 1998). The program acknowledged that it was through community forestry that upland poverty alleviation, social justice, equity in resource distribution, and forest stability can be successfully attained. Fortunately, the expansion of community forestry programs in the country was facilitated and supported by numerous international funding agencies providing both the technical and financial needs to sustain it (Pulhin 2002).

The orchestration of the history of forest destruction and degradation of the country, complemented by the various policies and trends involving the environment, vividly demonstrate the dominance of humans over the environment. Trends explicitly show how laws and policies intertwined with social, economic, political, and cultural contexts could turn the once-lush forest stocked with high-volume and prime timber species into an abandoned, denuded forest because of excessive logging operations. These trends also reflect how these policies were responsible in shaping the minds and lives of Filipinos through time. However, the later shift toward community forestry rekindled the possibility of recovering the once-denuded forest through better laws and policies. In understanding their nature, dynamics, and implications for change, policy intervention can lead to a new era of forestry conservation and management despite the changing environment in the age of the Anthropocene.



## Initial Detour: Community-Based Forest Management

Community-based Forest Management (CBFM) traces its history from the precolonial period, when humans were still living in harmony with nature, down to the destruction and degradation of forests in pursuit of growth and development. It is an attempt to salvage what is left due to the government's failure to ensure sustainability of forest resources and equitable access to forest benefits (Pulhin, Amaro, and Bacalla 2005). In effect, CBFM is the culmination of all the reflections from past forest governance and the country's efforts to address upland poverty and forest degradation.

The enactment of Executive Order No. 263 on 19 July 1995, which adopted CBFM as the national strategy for sustainable forest management and social justice, signaled the rise of people empowerment, community participation, and sustainable development—principles on which the policy was founded. CBFM evolved from earlier people-oriented programs, including FOM, FAR, and ISFP.

The implementation of CBFM is strengthened by other supporting policies such as (1) the Local Government Code (Republic Act 7160), which devolved some of the functions of DENR to the Local Government Units (LGUs) and provided numerous opportunities for forest management; (2) the National Integrated Protected Areas System Act of 1992, which encouraged the participation of communities in managing Protected Areas (PAs) through the issuance of tenure to communities residing within the buffer zones; (3) the Indigenous People Rights Act (IPRA) which promoted the rights of IPs over their ancestral lands, giving them the operational and collective-choice level rights (Ramirez, Lecciones, and Capiña 2019); (4) Executive Order No. 318, “Promoting Sustainable Forest Management in the Philippines,” which is the guiding principle for the holistic, sustainable, and integrated development of forestry resources while prioritizing rehabilitation, slope stabilization, and protection; and (5) the Philippine Strategy for Sustainable Development (PSSD), which promote restoration or rehabilitation of open and degraded forest lands (Rebugio et al. 2016).

A year after CBFM's enactment, the DENR issued DAO No. 96-29, “Rules and Regulations for the Implementation of E.O. 263” and Memorandum Circular No. 97-13, which provided the strategic action plan for CBFM. The plan envisioned that by 2008, about nine million hectares of forestlands will

be under community management, including the open areas from cancelled and expired TLAs. By the year 2004, the issuance of EO 318 under the Arroyo administration reiterated the achievement of sustainable forest management through CBFM. Amendments to the rules and regulations of CBFM were also made through the issuance of DAO No. 04-29. The changes removed some of the bureaucratic requirements, thus making the program more flexible for the participating communities (Pulhin, Inoue, and Enters 2007). As of 2018, there were 1,884 Community-Based Forest Management Agreements (CBFMAs) issued, covering 1,615,598 hectares and benefitting 1,884 People's Organizations (POs) across forestlands in the country (Table 1).

**TABLE 1.** Community-Based Forest Management Agreements

REGION	NO. ISSUED	TENURED AREA	BENEFICIARIES			NO. OF PEO- PLE'S ORGANIZA- TIONS	
			NO. OF MEMBERS				
			TOTAL	MALE	FEMALE		
Philippines	1,884	1,615,598	191,356	124,306	67,050	1,884	
CAR	88	62,787	1,647	1,193	454	88	
Region 1	19	38,654	11,951	7,999	3,952	139	
Region 2	109	264,280	8,420	6,421	1,999	109	
Region 3	120	66,823	6,242	4,893	1,349	120	
Region 4A	47	18,401	3,760	2,319	1,441	47	
MIMAROPA	77	90,145	6,836	4,566	2,270	77	
Region 5	119	49,702	8,462	5,603	2,859	119	
Region 6	104	34,054	8,555	5,691	2,864	104	
Region 7	211	57,656	14,794	9,149	5,645	211	
Region 8	144	117,509	8,355	5,447	2,908	144	
Region 9	145	90,193	10,948	6,842	4,106	145	
Region 10	294	209,147	28,537	19,365	9,172	294	
Region 11	105	210,063	8,633	6,233	2,400	105	
Region 12	56	96,101	9,943	7,462	2,481	56	
Region 13	126	210,083	54,273	31,123	23,150	126	

Source: Data from DENR-FMB (2018)

### **Key Actors Involved**

The interplay among the POs, the DENR, and the LGUs is necessary for the operationalization of CBFM. The POs are the main actors of forest management in charge of utilization, protection, and rehabilitation of forests and natural resources in exchange for the 25-year tenurial instrument, the CBFMA. To get a tenurial instrument, the POs should submit a Community Resource Management Framework (CRMF) and a five-year work plan containing the strategic plan of the community on how to manage and benefit from forest resources sustainably. This will serve as a guide for how the community will protect and use their resources as they implement equitable sharing among their members. The POs must implement the plans usually with little to no financial support. During their occupancy, they are tasked to protect, rehabilitate, and conserve natural resources as well as the adjacent forest lands. The people serve as forest guards as they protect the area against illegal loggers and timber poachers.

The DENR's role is dispersed throughout the implementation of the CBFM program. First, the DENR field offices identify possible CBFM sites and potential program participants. They are also tasked with the processing and approval of CBFMAs and providing technical assistance for the creation of CRMFs. During the implementation, the DENR field offices are tasked with monitoring and evaluation of the CBFMAs of the POs. The DENR-FMB serves as the National Coordinating Office of CBFM programs (CBFMPs), responsible for the drafting of policies, guidelines, and procedures on CBFM; reviewing CBFMPs; and liaising with other government and non-government organizations (NGOs) for their support in the program.

The Local Government Units (LGUs), on the other hand, participate in CBFM through the devolved functions of DENR. Policies and ordinances pertaining to forest management and protection are being enacted and implemented in their jurisdiction. Other actors involved in the program include the international funding agencies who provide technical and financial assistance to the POs, and academic or research institutions who aid in the formulation of science-based forest policy, provision of technical assistance, and project monitoring (Chokkalingam et al. 2006).

### **CBFM Across Time**

In the face of humans' antagonistic role in forest destruction and degradation, radical changes such as the paradigm shift toward community forestry have shown the country's desire to find multidisciplinary solutions to these problems. As such, the enactment of CBFM as the national strategy for sustainable upland development captured how the interplay of humans, environment, and policy can be beneficial overall. However, the challenge of implementing the CBFMPs and materializing their perceived benefits on the ground still remains. Box 3 provides selected case studies that narrate the implementation of CBFM in the Anthropocene.

**BOX 3. DECONSTRUCTING CBFM: INTERRELATIONSHIP OF PEOPLE, FOREST AND POLICY THROUGH TIME****Case Study #1: Community-based Forest Management Policy and Cultural Practices of the Sama People**

CBFM is the country's decisive step in promoting social equity and sustainable development through equitable access to forest resources. Complemented by the IPRA Law, the program acknowledges the capacity of the Indigenous Peoples (IPs) to manage their lands both for utilization and protection of the forest. Yet, Cuizon (2007), in his analysis of the impacts of Community Forest Management policy in the context of cultural practices of indigenous communities such as the Sama of Tagabaobo, revealed that CBFM is incongruous with the community's cultural practices. While there seems to be an alignment of the core goals between CBFM and the IKSP of the Sama, the objectives, focus, and processes were not necessarily aligned. CBFM was more concerned with the political issues and economic gains; the community, on the other hand, prioritized social and cultural dimensions. CBFM focused on improving the socioeconomic condition of the community, enhancing private investment, contributing economically, achieving global competitiveness, and increasing revenues and incomes of the communities and LGUs. Although the schemes provided for the efficient and effective use of the forest in a sustainable manner, they were contradictory with the community's resource extraction scheme, which leaned toward the communal sharing of resources within the integrity of the forest through a minimal utilization process.

Moreover, CBFM's operative terms such as the land tenure scheme, market capital and linkage, equity and share of proceeds, foreign funding, forest resource securitization strategy, incentives such as exemption from rentals and forest charges, assistance of environment-concerned agencies, pricing and commercialization of forest resources, livelihood and plantation projects, and contractual scheme did not embody the indigenous spirituality, values, and aspirations of the Sama people. The community promoted the sharing and subsistence use of resources, hence they were against the commercialization of tree plantation and excessive extraction of forest resources. The Sama upheld the natural replenishment process of the forest. They perceived that the CBFM's concept of forest management is incongruent with the epitome of their culture that leaned toward environmental protection and care (Cuizon 2007).

This case shows the points of contradiction or disconnection with regards to ground implementation of the CBFM. This can be a good opportunity to ensure that the policy would evolve in a manner that will meet with the aspirations of its target beneficiaries, such as the indigenous peoples. Since a large portion of the forestlands is entrusted to them, the government must rediscover a strategy that can support them without neglecting the

overall environmental and economic goals of the country. The story of the Sama community portrays the mutual relationship between humans and the environment—one that is deeply ingrained in their hearts and minds. Tested through time, the community has been successful in passing on the genuine regard for nature as reflected by the positive response of the current generation toward prioritizing the protection and conservation of their environment.

### **Case #2: Behind the Fragile Enterprise: Community-based Timber Utilization in Southern Philippines**

The implementation of CBFM also led to the emergence of community-based timber enterprises (CBTE) as influenced by the industrialization of the forestry sector. The Ngan, Panansalan, Pagsabangan Forest Resource Development Cooperative (NPPFRDC) in Compostela, Davao de Oro (formerly known as Compostela Valley) in the Southern Philippines, was one of the earlier government experiments on the facilitation of the smooth transition from corporate timber enterprise to a community-based approach. Consistent with the goals of sustainable forestry and social justice, NPPFRDC was managed by technically competent professionals while the major policy decisions rested with the cooperative's general assembly and board of directors, with representatives from the Mandaya Mansaka community. This organization satisfied both the business functionality of the enterprise and cooperative requirements of CBFM. In 2000, the community, with government support, was certified by SmartWood for satisfying the criteria of a sustainably managed forestland (Pulhin and Ramirez 2005).

Pulhin and Ramirez (2005) concluded that the combined impacts of unstable and restrictive forest policy, weak institutional support from government, and limited alternative sources of local livelihoods curtailed the potential economic returns and other positive contributions of CBTE. For instance, the consecutive national cancellation of Resource Use Permits (RUPs) by three DENR Secretaries have greatly impaired the logging operation. Despite the accreditation from SmartWood, the absence of an enabling policy and the lack of appropriate institutional support hampered the obtainment of the expected benefits for NPPFRDC. Conversely, the accreditation became an additional cost to the enterprise since the government did not provide the necessary market mechanism. Indeed, the combination of external and internal factors increases the fragility of an enterprise.

Democratization of the forest policymaking process and the genuine devolution of forest management in favor of the local communities are crucial to making the enterprise more robust and sustainable. To achieve real livelihood benefits, the government should provide appropriate institutional support systems, including market assistance so that they can function as economically viable enterprises (Pulhin and Ramirez 2005).

NPPFRDC has a similar story with SUDECOR and PICOP. Regardless of the good start and supportive POs, what jeopardized the situation of these companies

were the contradicting policies imposed by the government. It was also observed that these policies continuously evolved depending on the vested interests of the implementers. For instance, the implementation of EO 23 or the total log ban kept the legal extractors from harvesting the forest resources and thereby encouraging illegal extractors and encroachers. As elaborated by Dahal (2006), NPPFRDC is a tangible example of a government's initiative with well-crafted and science-based law, but was not sustained because of the inconsistencies in the implementation and entangling issues along the way.

### **Case #3: Governance Challenges in Community-Based Forest Management in the Philippines**

The Northern Negros Natural Park (NNNP) is one of the Protected Areas under the National Integrated Protected Areas System (NIPAS) Act of 1992 that depicted the intertwining problem on policy governance and environmental, social, and political aspects. Inside the NNNP are the multiple overlapping CBFM projects, Integrated Social Forestry Program (ISFP), and CBFM agreements, including the Community Stewardship Certificates (CSCs) that were awarded to individual recipients. Despite the numerous tenurial instruments, the combination of local factors hindered the achievement of an improved ecological balance of the seriously degraded forest and the enhanced socioeconomic status of both the indigenous and migrant families. In contrast with the assumption of the community, the different barangays inside the park were not homogenous, subsistence-oriented, marginalized from markets, forest-dependent, or conservation-minded. The communities were composed of groups of Ata and Bukidnon communities, and migrants. They had various socioeconomic status and little sense of community (sense of solidarity, social organization and group decision-making, and land and forest management efforts). Regardless of the established Peoples Organizations (POs), most of them were unaware of the need to have a unified decision toward a resource extraction scheme for sustainable use. Although they were aware of the illegal and destructive practices in the area, they chose to overlook these things to avoid arguments. They were also unaware of the legalities of their tenurial instruments and lacked experience in conservation and community resource management (Cagalanan 2015).

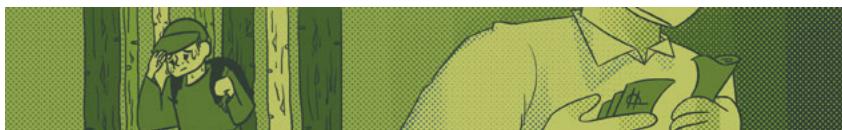
Structural factors, particularly the scale of institutions, were identified as one of the underlying problems. Conservation management varied at different levels starting from transnational funding or conservation agencies to the state, province, protected area, local government unit, municipality, barangay, people's organization, and household. This hierarchy of scales and their roles and tasks were not clearly operationalized on the ground. Challenges included limited human resource and financial support. These hampered government institutions from carrying out the intended program for the benefit of the community. The failure to empower the community led to project mentality. Similarly, the park faced numerous overlapping but

poorly integrated initiatives between offices across institutional scales and on the ground (Cagalanan 2015).

New efforts were launched in 2011: the National Greening Program of the DENR and BINHI Program under the Energy Development Corporation. Positive developments emerged and the organization in Bagong Silang was awarded as the top nursery in the region by the DENR. Likewise, they were recognized as among the top 10 CBFM POs nationwide. The positive changes were due not only to the new programs and financial support, but also because of the new chairman of the organization who was a local pastor with experience in community organizing and service (Cagalanan 2015).

The experience of NNNP is a typical CBFM case faced with entangling issues and concerns on the ground. Apart from internal problems in the community, the numerous and overlapping forestry initiatives had been thwarting one another's intended benefits for the participants. Similarly, the undefined boundaries of the laws and their entangling implementation divided the people instead of unifying them. For instance, acting under the existing NIPAS Act, IPRA Law, and EO 263 of CBFM—as well as the various rural development programs and agrarian reforms from different institutions including the LGUs, down to the barangay level—without the goal of harmonizing them will just continue to lead the future of community forestry into a limbo. But the radical change of a small organization inside the NNNP in Bagong Silang proved that community forestry offers hope to pursue forest restoration through the cumulative sustainable management efforts of the upland communities.

Glimpses of these narratives reveal the various faces of the human-environment interaction in this contemporary world. Based on these accounts, the core goals of CBFM have yet to be attained and the full intended benefits have yet to be felt by the majority of upland communities. Most of the findings from the field studies and multisectoral assessments revealed that the progress on the ground was actually incongruous with the intention of both the CBFM and Social Forestry. Reexamining CBFM based on its principles provides a general perspective on the implementation of CBFM through time.



#### Principle #1: Social justice and equity

Social justice and equity, as elaborated by Rebugio (1995), is the equal distribution of forest resource benefits among different sectors of society, particularly the poor. From the ownership of elite TLA holders, hectares of forestland were transferred to CBFM POs through the program. With this,

the government reflected justness in its allocation of forestlands to the local communities. Likewise, recipients of the agreements were accepted fairly based on the established criteria and procedures (Bacalla 2006). Unfortunately, the unstable policies on timber harvesting and nationwide cancellation of all CBFMAs, together with the bureaucratic issues involved in timber harvesting, thwarted the intended growth of the forestry sector. The rights that should have been given to the POs turned into responsibilities to develop and protect the forest (Pulhin, Inoue, and Enters 2007). At the local level, CBFM also struggled in achieving social equity and benefit-sharing among the members. The villages' elite composed of leaders and educated members reaped most of the benefits of CBFM at the expense of the poorer members (Dahal and Capistrano 2006).

In terms of gender roles, Table 1 shows that gender equity is not yet fully realized at the ground level based on the significant difference between the number of male and female members of the POs despite various efforts to mainstream the Gender and Development (GAD) programs.

#### **Principle #2: Sustainable development**

Consistent with the Brundtland Report in 1987, sustainable development is the idea that human societies must live and meet their needs without compromising the ability of future generations to meet their own. This principle was upheld through the proper implementation of CBFM strategies such as plantation establishment, reforestation, and agroforestry, which resulted in the increase of forest cover. Likewise, most of the POs also observed improvement in the environmental quality particularly in the water supply, soil fertility, and microclimate of the area. The PO members safeguarded the forested area and those adjacent to it even without any allowances, thus strengthening forest protection. Narratives on the commitment of these forest guards presented in the succeeding chapter prove their high regard for sustainability and protection. In contrast, the logging concessionaires who had abandoned the forests since the cancellation of the TLAs also left the roads leading to these areas, which gave way for new encroachment. The accessibility of these residual forests attracted many agents of degradation, such as the upland migrants who practiced slash-and-burn and intensive agriculture. These activities were even compounded with illegal logging despite the imposed nationwide log ban (Rebugio et al. 2016). The insufficient support from CBFM pushed even some of the PO members to engage in illegal cutting activities to support their family (Pulhin, Inoue, and Enters 2007).

#### **Principle #3: Community participation**

While early parts of CBFM implementation showed significant improvements in the condition of most of the community participants, these were just short-lived. Pulhin, Inoue, and Enters (2007) stated that once the project was finished and the funds ran out, most of the people started losing interest as

they perceive CBFM as just a project. Although there were those who received long-term technical and financial support and had greater socioeconomic gains, they were only a few compared with the whole population of CBFM.

In terms of socioeconomic development, other livelihood and enterprises that were provided aside from timber harvesting were typically ill-conceived and unsustainable. Opportunities to process agroforestry products locally were rare, such that chances to generate more income were often missed. Many LGUs failed to support and assist the CBFM POs because they did not understand their role as stipulated in EO 263 and RA 7160. For instance, LGUs could support the CBFMPs by providing farm-to-market roads, market linkages and opportunities, local water supplies and electricity, and social infrastructure (Pulhin, Inoue, and Enters 2007).

Until now, most of the forest/ecosystem services still do not have market prices, making it easier to compromise over the production of less valuable goods or services. The pressure to provide food for the growing population and the growth-centered economic model push upland dwellers to not only intensify their agriculture, but to also expand in forestlands, adding to forest degradation. Likewise, the CBFM POs who rehabilitated the forest and prevented soil erosion were not paid for their efforts despite the benefits that reached even the downstream areas (Rebugio et al. 2016).

From a political perspective, another point of departure is the deficiencies in the policy itself and its implementation, which is consistent with the findings during the Marcos martial law period. The policy was inadequately articulated and there was a gap between its stipulation and the actual implementation on the ground. Another factor is that the LGUs and the POs were given only limited devolving power in terms of functions and responsibilities which eventually led to poor governance. The poor implementation was also linked to bureaucracy, corruption, and elite-biased policies both locally and nationally, resulting from poor governance and non-supportive institutional structures. In a broader sense, this reality can be associated with the influences of the previous colonizers. For the longest time, the State had control over forest management and still believes that forest protection and development are dependent on DENR. Regardless of the devolution, the community were still subtly perceived as enemies of the forest, reflected in the frequent changes in forest policies. Hence, the program failed to develop the sense of ownership and accountability toward forest management among the CBFM POs (Dahal 2006).

The ideal and envisioned impacts of CBFM clearly did not materialize because the main legal, political, and economic orientations of the country are not conducive to the true fulfillment of social equity, sustainability and community participation. The problem is no longer about the appropriateness of policies but on the weak administration and implementation of existing laws (Hyman 1983). Weak accountability structure, poor participation and transparency in decision-making, bureaucratic apathy, corruption, elites capturing the devolved power, and inequitable resource distribution are

the reflections of the contesting powers and interest of policymakers, policy implementers, and the recipients of these policies (Dahal 2006).

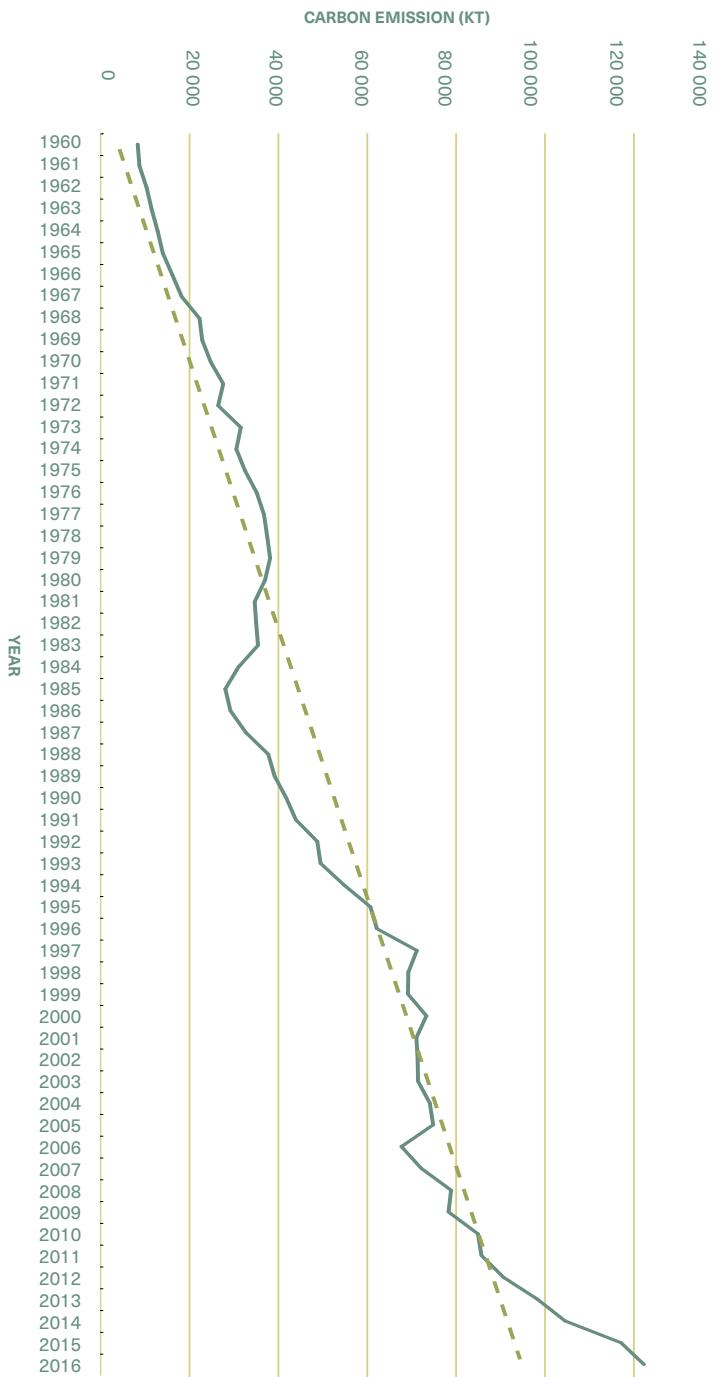
### **Facets of CBFM in the Anthropocene**

In light of the wide gap in the realized benefits of CBFM, understanding the factors that can narrow this gap means an opportunity for the country to redirect its course toward an equitable and sustainable upland community in the Anthropocene. Yet, proximate causes of its failure reveal that these problems are beyond the boundaries of the forestry sector. As such, intersection of the concerns on its implementation and the contemporary issues on the environmental, socioeconomic, health, and political areas should be defined. Apparently, these broader entangling problems depict the various facets of the Anthropocene that demand urgent and well-thought solutions.

#### **Facet #1: Carbon emissions, climate change, and global warming**

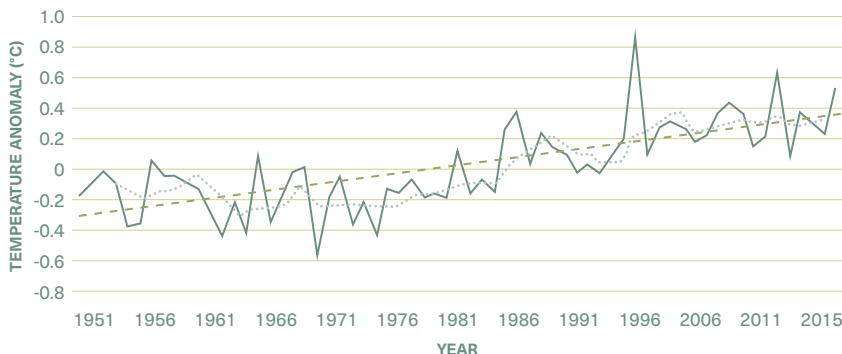
Irreversible alterations in the biogeochemical cycles of the earth are brought largely by the remarkable increase in the atmospheric carbon that started during the Industrial Revolution. A growing bottleneck on primary energy sources led to the discovery and exploitation of fossil fuels. However, the burning of fossil fuels indelibly mark the upsurge of greenhouse gases (GHGs) such as carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ), and nitrous oxide ( $\text{N}_2\text{O}$ ) (Steffen et al. 2011). Likewise, series of timber extractions, forest land conversions, and agricultural expansions, including the destructive kaingin in tropical countries like the Philippines, initiated the release of the long-sequestered carbon stored in the forests (Malhi et al. 2014). The estimated carbon release (Figure 4) because of forest destruction since the 1500s is 3.7 Pg (Lasco 1998), and 70 percent of this was released during the twentieth century (Lasco and Pulhin 2000). If unsustainable and wide-scale land conversion and agrarian transitions will persist, this means an increasing trajectory of atmospheric  $\text{CO}_2$ .

Increase in the  $\text{CO}_2$  along with other GHGs such as  $\text{CH}_4$  and  $\text{N}_2\text{O}$  intensifies the anthropogenic climate change. The unusual rise of global temperature is strong evidence of change beyond the natural variability of the Earth's climate system (UNISDR 2008). Consequently, the increasing atmospheric  $\text{CO}_2$  has a direct relationship with the global air and ocean temperatures. For instance, the annual mean temperature anomalies in the Philippines from 1951 to 2010 as shown in Figure 5 proves the increasing weather variabilities and extremes toward the twenty-first century. The positive anomaly reveals that for the past decades, the temperature in the Philippines was abruptly warmer than that of the baseline. Unfortunately, this situation is not an isolated case but is true to all parts of the world. Based on the recent IPCC Special Report (2018), global warming will likely rise by  $1.5^\circ\text{C}$  between 2030 and 2052. If the world will continue with the business as usual (BAU) scenario, worst changes in the climate system



**FIGURE 4.** Carbon Emission (kt) in the Philippines 1960–2016 (World Bank 2019)

will persist inflicting irreversible damage to all sectors, amplifying difficulty of existence for all the organisms, including humans, in the coming decades.



**FIGURE 5.** Observed annual mean temperature anomalies (1951–2015) in the Philippines based on 1971–2000 normal values (PAGASA-DOST 2018)

#### Facet #2: Worsening climate change impacts and disasters

The increase in the global mean temperature has also resulted in alterations of biogeochemical cycles and in the spatial extent, duration, and timing of weather and climate extremes, which also led to unprecedented extreme events (Seneviratne et al. 2012). Obvious manifestations include numerous and intensified drought incidents, heat waves, wildfires, strong typhoons, and series of flash flood events causing landslides, which led to thousands of unfortunate fatalities. Although strong typhoons are never new, Typhoon Haiyan (Yolanda) in 2013 tremendously devastated the country with almost 6,300 total deaths due to storm surges and extreme rainfall that caused flooding in most areas in Tacloban City, Philippines. Likewise, the consecutive typhoons toward the end of 2020 (Quinta, Rolly, and Ulysses) demonstrated the projected increase in the frequency and intensity of typhoons as a result of sea level rise and ocean warming brought by anthropogenic climate change (Laffoley and Baxter 2016; Santos et al. 2015; UNISDR 2008). Extreme drought and dry spells in 2015 and 2016 have impaired almost 42 percent of the country, particularly in Visayas and Mindanao. Aside from direct impacts to the agricultural sector, the extreme weather events have also affected the fisheries because of the change in the water temperature. Likewise, they have caused numerous forest fires across the country (Red Cross and IFRC 2016). Overall, the worsening climate change and global warming scenarios have exacerbated the current vulnerable condition in the upland communities. Yet, greater climate change impacts and unprecedented disasters will most likely occur as the anthropocentric view of humans persists.

#### Facet #3: Burgeoning population and needs

Since the global population boom after World War II, developing countries like

the Philippines have multiplied their population together with complex growing needs. As shown in Figure 6, the country's population has been increasing since 1959, with more than 100 million people at present. The increasing population can also be translated into rising demand and dependability on forest resources. Demand for necessities such as food, water, shelter, clothing, medicine, and livelihood is also expanding, as well as complex wants of the growing population. Similarly, the demand for essential ecosystem services such as climate change mitigation and adaptation, soil erosion and flood control, and carbon sequestration are also surging. Despite all the benefits from forests, they are oftentimes deliberately compromised to serve the needs of the growing population. As the population progresses toward the Anthropocene, it will continue to entail more complex sets of needs and wants, hence adding more pressure to the forest ecosystem.

#### Facet #4: Culture of global extractivism and commodification

From the perspective of socioeconomics, the driving forces of globalization and capitalistic economy continue to threaten the environment because of the persisting culture of global extractivism (Douai and Montalban 2009). Extractivism economy refers to the industries, actors, and financial flows, as well as to the economic, material, and social processes and outputs, associated with the globalized extraction of natural resources. Typically, this culture involves the removal of raw materials from previously colonized countries such as the Philippines, and the processing, sale, and consumption of those materials in a global economy that disproportionately benefits nations, transnational corporations, and consumers in the developed world (OHCHR 2019). Evidently, this culture calls for new demands from former colonial powers that support their own interests, including the national and local elites. From the Philippine context, it can be defined by the intensive extraction of natural resources; monocultural and large-scale agricultural, forestry, and fisheries operations; and low requirements for processing with the intention of extracting materials for export purposes (Prall 2018). Oftentimes, the country exports raw materials such as logs and mineral products like coal, copper, gold, and nickel which will then be processed in the developed country, and in return be sold in the Philippines as finished products with relatively higher prices (Delina 2021).

Moreover, the extractivism culture is akin to the issue on the commodification of the natural resources. Commodification of nature simply pertains to the conversion of natural resources into commodities (Hahn et al., 2015). As compared with the mutualistic human-environment relationship, capitalistic economy dominated that relationship and gave way to a nature-divorced regime of extraction (Delina 2021). Despite the global advocacy on sustainable development, commodification has resulted in overexploitation of forest resources—to the extent of degradation—just to meet the growing demand. During the logging years, commoditization of timber is prevalent because it can be produced in large quantities, has an established process for

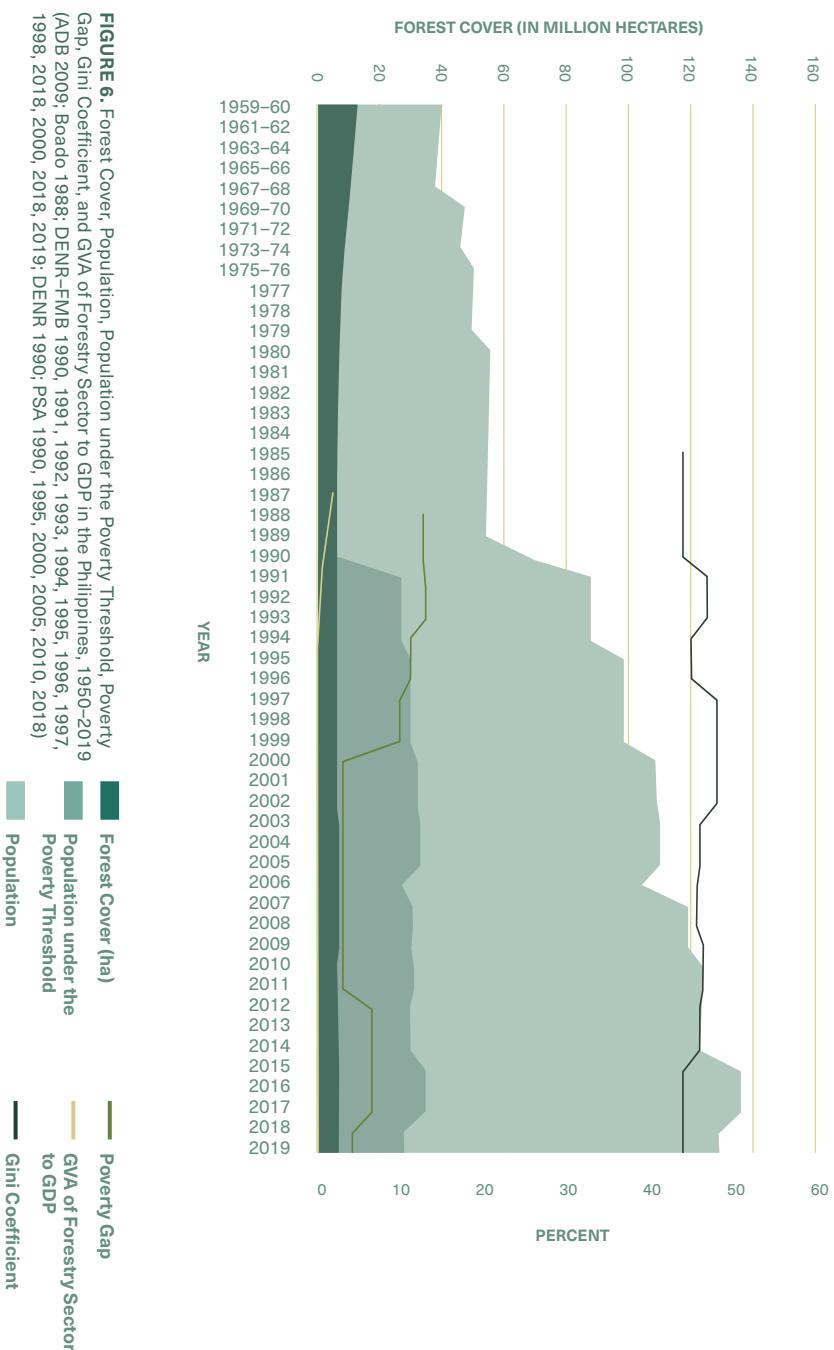
packaging and shipping, and can be used in a standard fashion by a wide range of potential end-users, regardless of location or circumstances (Caputo 2012), this promoting monocultured large-scale forest plantations that can satisfy demands at the expense of forest biodiversity.

#### Facet #5: Agricultural expansion and intensification

Prevalence of land conversion and intensive agriculture in the Philippines reflect one of the major contemporary problems on burgeoning population and upland poverty. According to Geist and Lambin (2002), agricultural expansion is the prominent land-use change that predominantly leads to deforestation. It takes the form of permanent cropping, cattle ranching, shifting cultivation, and colonization agriculture. At one end, agricultural expansion persists because forests are oftentimes seen as unproductive lands by migrant people, therefore converting the forest to agricultural areas poses no problem for them. Unfortunately, these migrant people continue to employ lowland farming practices, resulting in heavily degraded soils that become unproductive after two or three cropping seasons. Similarly, highland vegetable farming, practiced across the country, requires regular burning resulting in soil erosion and further degradation. Hence, farmers are forced to expand their farms toward the forest in search for more fertile land for agriculture. The increasing demand and available markets are some reasons why upland communities intensify their farming at the expense of degrading the forest with low regard for the ecological services that it provides (Carandang et al. 2012). On the other end, large-scale agro-industrial agricultural conversion is brought by multinational companies to provide for the global market demands (Malhi et al. 2014). Among these are the oil palm plantations, rubber plantations, coconut plantations, and other cash crops. However, it is clear that both forms exacerbate the underlying problems leading to widespread poverty and inequality in the uplands (Carandang et al. 2012).

#### Facet #6: Poverty and inequality

Poverty and inequality in the uplands reflect that wealth is inversely linked to deforestation. This issue resurfaces at the intersections of forestry and rural development. In the typical setup, the communities in the uplands are the landless lowlanders who have settled down in the public forestlands for livelihood and shelter. It also unravels the failure of macroeconomic policies to provide employment and to address poverty in the lowlands, which is the primary reason for upland migration (Carandang et al. 2012). Since 1990, the proportion of the population below the poverty threshold is almost constantly similar to the poverty gap and inequality gap measured using the Gini coefficient (Figure 6). Hence, this explains the poverty-driven deforestation which refers to the ecological marginalization of farmers who have lost their resource entitlements. Coupled with the capitalistic economy, livelihoods that are highly dependent on the forest ecosystem tend to be unsustainable

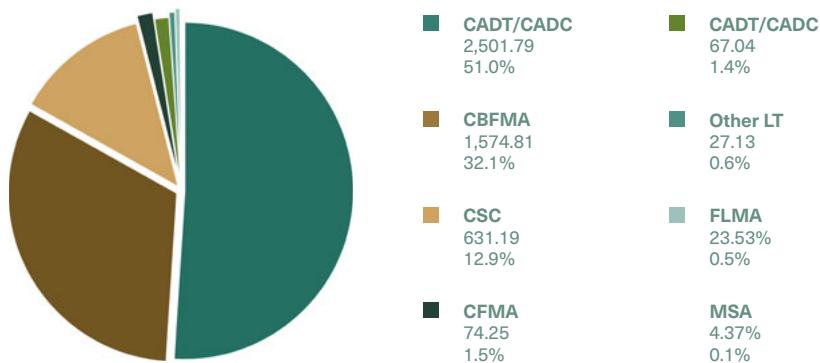


agriculture for subsistence and income generation (Geist and Lambin 2002). Likewise, increased frequency and intensity of natural disasters and climate change impacts multiply the vulnerability of the marginalized upland communities (Huntjens and Nachbar 2015).

Moreover, the inequality gap as represented by the Gini coefficient implies that there is an existing large gap in wealth distribution among the population. This demonstrates the inability of the government to trickle down tangible benefits for the growing economy of the Philippines. Thus, it demands true rural development through various government programs including CBFM. As presented in Box 3, it is evident that the absence of the mutual connections between the people and the forest promotes a subsistence and cash economy that degrades the forests and threatens its biodiversity. In light of these problems, CBFM is an attempt of by Philippine Government to address these concerns despite the negative notions of being the forest destroyers to conservation partners.

#### Facet #7: Land tenure and accompanied rights

Despite the numerous tenurial instruments, hindrances in the sustainable upland development persist including tenurial insecurity, overlapping rights, and unclear benefit-sharing mechanism. Figure 7 shows the various community forestry initiatives in the country that are under the umbrella program, CBFM, as the country's national strategy for social equity and sustainable upland development. As observed in the NNNP account (Box 3), in practice most of these programs overlapped with one another and caused confusion among the recipients. This reflects the lack of integration between offices across the institutional scales, particularly within the DENR as the lead agency (Cagalanan 2015). Likewise, the conflicting land ownership impairs the rights of the tenurial recipients over the trees that they have grown. Insufficient incentives and production and marketing support from the government, including the LGUs, thwart the intended benefits. Bureaucracy in both the land tenure approval and forest management, specifically on harvesting schemes and permits, add to the difficulty faced by the communities because of the unrealistic bottom-up approach in most of these community-based forestry initiatives (Chokkalingam et al. 2006). With this, it is imperative that policy interventions and programs are integrated and harmonized to bring about the desired goal of a sustainably managed forest.



**FIGURE 7.** Various Types of Tenurial Instruments in Forestlands under Community-Based Forest Management: Certificate of Ancestral Domain Title (CADT)/Certificate of Ancestral Domain Claim (CADC), Certificate of Forest Stewardship Agreement (CFSA)/Certificate of Community Forest Stewardship (CCFS), Community Forest Management Agreement (CFMA), Certificate of Stewardship Contract (CSC), Forest Land Management Agreement (FLMA), Community-Based Forest Management Agreement (CBFMA), and Other Land Tenure (LT) (DENR-FMB 2007)

#### Facet #8: Mining industry

Apart from the mechanized logging concession areas, a large portion of the Philippine forest has been deforested and degraded because of large-scale and small-scale mining activities (Carandang et al. 2012). As the fifth most mineralized country, global and local demand for minerals has always been high since American colonization. In general, mining in the Philippines is largely driven by globalization and is typically owned by multinational corporations. According to Sonter et al. (2017), the assumption that mining only accounts for one percent of tropical deforestation is contradictory to its real impact that is almost ten times greater. The severity of the destruction, including the generated wastes and pollution brought by mining, has already been felt. Further, other civilian conflicts on tenure, resources, benefits, and even cultural concerns are usually accompanied by the establishment of mining areas. Unfortunately, the government has no clear policies yet (aside from RA 7942, the Philippine Mining Act or RA 7076, the People's Small Scale Mining Act of 1991) which could protect the forest from illegal mining and strengthen forest rehabilitation and restoration in the degraded forest areas. Ironically, mining companies, unlike the logging concessionaires, continue to operate and expand despite the numerous evidence of their impact on forest degradation.



#### Facet #9: Zoonotic diseases

The global impact of the recent pandemic has resurfaced the interrelationship

of forest destruction, animals, and zoonosis. COVID-19 and the Ebola virus are examples of zoonotic diseases. These are diseases usually caused by pathogens that infect animals and are transferred to humans through zoonotic spillover, which is defined as the transmission of pathogens from animals to humans. Prior to the novel coronavirus outbreak, scientists have already warned about the consequences of the conversions on the Earth's landscape, particularly its impact on human health. Since then, more evidence has proved the correlation of forest loss and fragmentation because of its continuous encroachment and the increasing risk of animal-borne infectious diseases. The forest serves as a protective barrier for pathogens and the untapped source of medicines; therefore, the increase in its fragmentation also implies increasing vulnerability of the nearest community. In addition to that, activities such as intensive agriculture, kaingin, logging, hunting, and mining expose workers to animals, directly increasing their risk of having zoonotic diseases. With the extent of COVID-19's impact in the Philippines, policy interventions with clear implementation guidelines must be carried out for the protection and prevention of possible zoonotic outbreaks in the future (Rott 2020).

#### Facet #10: Political inconsistencies

The history of forest utilization, destruction, and degradation in the Philippines also reveals power relations as manifested by the enacted and implemented laws. These laws, although made in the past, have continued to shape the future. However, most of these laws need to be amended to adapt to contemporary issues that are distinct from previous problems. Many contradicting policies tend to exacerbate the current situation of the marginalized population. Despite the enacted Philippine Selective Logging System (SLS), most of the logging concessionaires have chosen the extensive and unsustainable method of timber extraction due to its promising profitability. The pressure to meet the increasing demand for timber in the international market encouraged the concessionaires to pursue easy money but short-lived economic development. Even with the existence of laws and sanctions, implementation of these laws is not observed while the culture of corruption among the government, elites, and politicians predominates the forestry sector. Unfortunately, irresponsible timber harvesting opened the already degraded forest to further destruction through intensive agriculture, kaingin, charcoal-making, and fuelwood harvesting (Vitug 1993).

The traumatic experience of forest degradation brought by unsustainable logging practices resulted in the failure to balance protection and production in relation to forest management. As observed in the recent policy direction, majority of the policies lean toward forest conservation and sustainable forest livelihoods under the Sustainable Forest Management and Community Forestry. Conflicting and shifting policies have transformed the forest industry into a sunset economy (an industry in decline, one that has passed its peak or boom periods) as observed with the decreasing trend of gross value added (GVA) of the forestry sector to Philippine GDP. From numerous logging

concessionaires that generate income for the country, the Philippines is now left with only two logging concessionaires that legally operate in Samar and Zamboanga del Norte (DENR-FMB 2019). Consistent with the experience of SUDECOR, the enactment of Executive Order No. 23, or the Moratorium on Cutting and Harvesting of Timber has negatively affected the forest industry. Further, the peculiarity of the timber industry, long gestation period, high cost, prolonged return on investment (ROI), and diminishing investment, espoused with a lack of political will and good governance, unclear policy guidelines, and historical pitfalls of extractivism, will continue to beset the potentials of the production services that forestry can provide.

The challenges in the Anthropocene open up entangling problems that are beyond the boundaries of forestry. With this, a call for an integrated approach across all the other sectors should be done. There is a need to clearly define the direction and the unifying goal of the country that will be the basis of plans and actions to be taken by the various sectors of the society. It is crucial to redirect the scattered efforts, initiatives, programs, and projects of all sectors into one main direction, hence working in synergy and complementing each other in achieving the desired shared goal. Looking at the Philippine setting, it seems like a radical change is necessary and it will require key and influential people to initiate the steps toward a brighter and secured future.

The Anthropocene is beyond colonial influence and the surrounding global system. The real main challenge is humans' behavior toward the environment. Our connection with the environment barely exists anymore—care is no longer ingrained in the hearts and minds of people, thereby making it easier to neglect existing resources. Humans' way of life is no longer committed to environmental protection and care, but driven by selfish desire for growth, development, and advancement, usually at the expense of the environment. Resources are no longer intended for the community, but for individual needs as well as business profit amid global pressures expected from each country. Evidently, behind this human-environment connection are the laws and policies that influence the evolution of their relationship. These laws and policies have the power and authority to impact the course of the Philippines. Contemporary problems that were initially identified in the environmental sector were realized as encompassing issues that involved the whole society at various levels. Different domains such as environmental, cultural, social, economic and development, political, and health must be integrated to address the concerns in this new age.

Indeed, we are now confronted with the choice to go with the business-as-usual lifestyle or to start doing simple things that can reverse the destructive impacts of the Anthropocene. With a renewed mindset, we can start making a difference, starting individually then collectively as a nation. Hopefully, the changes we make can eventually create an impact in the increasingly decimated Philippine forest landscapes by working together to minimize its damage even as we pursue the path of growth and development.



## Future Trajectories

The rising concern about the Anthropocene has resulted in the global acknowledgement of the impacts of human activities to the structure and functioning of the Earth System. It is a challenge in both research and policy to provide a universally accepted strategy to achieve sustainability of the Earth despite the human-induced stresses. In the Philippines, improvements with existing laws, specifically in the implementation phase, coupled with technological advances have the potential to reverse the destructive effects of the Anthropocene.

### Fourth Industrial Revolution and Development

The ingenuity of Filipinos as reflected in various research can be relied on to grow and develop as a nation while decreasing the deteriorating impacts to the environment. Investing on research and development, particularly in the forestry sector, could signal the Fourth Industrial Revolution, promising hyper-connectivity and technological breakthroughs without compromising the environment. Real-time information about the country's tropical forests can be used to better understand and analyze them. Permanent monitoring sites covering the different types of forest ecosystem can be established to gather data more effectively. The potential of the available technologies such as remote sensing, satellites, drones or aircrafts, imagery and Light Detection and Ranging (LiDAR) 3D cloud points, Geographic Information System (GIS) software, infrared and high resolution cameras, and laser scanners can be maximized to capture the dynamics of the forest in the changing environment and its influence on the adjacent ecosystems. Innovations in information and communication technologies can provide the real-time data for different 3D forest simulations and forecasting to better guide reforestation and rehabilitation initiatives. These can bring breakthroughs in forest inventories and biodiversity assessments.

Since the maturity of trees and the forests takes quite a long time, simulations and forecasting are necessary in making wise decisions and plans for present and future scenarios, thus being consistent with the goal of sustainable forest management. Certain innovations can also serve as effective tools for the management of forest plantations and proper

applications of silvicultural treatments. This, in turn, can provide proper value for ecosystem services provided by the forest and its biodiversity. Besides carbon sequestration and soil and water conservation from forest, the potential of phytoremediation using woody plants, rhizo-remediation, and green applications through microbes assistance can also be studied.

Similarly, advances in forest biotechnology can be explored through specific tree-based applications for clonal propagation, marker-aided selection and breeding, genetic engineering, genomics, and other tree improvements (Hetenäki and Mery, n.d.). Artificial intelligence and synthetic biology can also be applied in the context of forestry and natural resources. Technological advancements are also necessary to improve forest management and resource extraction, particularly in the wood-based industries. Also, the increased information about the forest and its biodiversity can help in boosting the market for non-timber forest products. These scientific and technological advancements should be wisely implemented with precaution because they are like double-edged swords—they can be used to develop the forest and other related activities, but at the same time be utilized to abuse the forest.

### **Multidisciplinary Research: Coupling of Natural Science and Social Science**

Scientific advancement should be complemented with studies of people who will be affected by these innovations, including existing social structures. These studies can help better understand the human-environment interactions, particularly how anthropogenic activities impact the environment. They can give deeper insights about the core reasons of the Anthropocene, particularly forest destruction and degradation. The wide range of social sciences cover the understanding of growth and development, market-based decision-making, consumerism, technological development, and the array of dominating geopolitical and economic arrangements.

Theoretically, the studies can help identify the structural, institutional, and cultural factors that have influenced the agents of forest degradation. Methodologically, they can serve as empirical tests on theories and policy proposals concerning the Anthropocene. Similarly, the evolution of human behavior toward the environment can also help us understand the motives for resource management and extraction for each person. While most of the policies now are science-based, failing to appropriate these laws to the involved stakeholders and the institutional, political, economic, and cultural contexts, as well as the historical trends and global processes that surround them, could lead to inefficient and ineffective policies and programs (Rosa et al. 2015).

### **Emerging Topics for Future Research and Development**

Cross-cutting concerns of biophysical and social sciences can lead to new pathways for research such as the expansion of agribusiness estates under the ASEAN integration in the Southeast Asian region. Discourse on biocultural resources over economic resources may encourage more people to rediscover

sustainable manner of living in harmony with nature. These emerging areas can be of interest to the new generations of scientists and engineers to become better prepared in handling the perceived future changes. Likewise, the pressing concern on zoonotic diseases as experienced globally due to the spread of COVID -19 revealed fresh insights on the coupling of environmental and medical science. Understanding these two branches of science is essential to spare and prepare the next generation for unprecedented circumstances such as the current pandemic.

### **Crowdsourcing through Citizen Science**

The emerging concept of “citizen science,” which encourages public participation and collaboration in scientific research can help bridge the gap between research and policy implementation. People, through citizen science, actively share and contribute to data monitoring and collection programs. Broader data sources will not just help provide accurate results for research but can also shape policies. Taking CBFM as an example, no succeeding amendment based on stakeholder consultation was made since 2004 that could have solved the problems encountered along its implementation. The voices of each people’s organization could have been heard and acknowledged to address the problem.

### **Policy Reforms and Trajectories**

Since the problem with most of the policies lies heavily on the implementation phase, CBFM amendments must be based on what research has identified as gaps and challenges. Policy reforms should be done not only for the sake of certain legal processes but to also guide implementation, monitoring, and evaluation. At the core of this is strengthening the sustainable livelihood component of CBFM through a comprehensive package of technical, budgetary, and marketing support. Weakness of the current devolution process should also be addressed through the transfer of decision-making concerning local forest management. This could address the bureaucratic inefficiency and corruption in the forestry sector and provide stable and consistent policies aligned with the array of rights given to the POs (Dahal 2006). Additionally, enactment of a Sustainable Forest Management Act can be hastened to provide a more stable policy environment and implementation for CBFM with clear provisions on resource use rights (Ramirez, Lecciones, and Capiña 2019).

Future policy reforms should be anchored on good forest governance principles. They should install appropriate mechanisms and processes that ensure deeper and meaningful partnership with key actors to encourage sharing and transfer of knowledge, skills, lessons learned, and resources. Clear roles and accountability, active participation, transparency, and equity in sharing of costs and benefits among the key stakeholders, including the involved government agencies, should also be ensured. The passage of responsive policies, including increased budget allocation for research and development, is also essential to support the growing community.



## Conclusion

The current environmental problems speak clearly of the new geologic age called the Anthropocene. Since colonization, humans have become the major force that induces environmental change to the point of altering biogeochemical cycles. The country's tragic history of forest degradation depicts the severity of human activities in pursuit of growth and development. Through the establishment of forest institutions and enactment of policies, exploitation of the natural resources, particularly timber, was legalized. Thankfully, the worsening forest denudation pushed the shift toward community forestry and forest conservation. The enactment of EO 263 establishing CBFM is the culmination of all the learnings from past experiences. It is built upon the principles of social equity, sustainability, and community participation. At first, significant changes have been observed in the CBFM POs, but in the long run the program has become contradictory with its initial intentions. Studies revealed that regardless of CBFM and the sound laws and policies supporting it, still the main legal, political, and economic orientations of the country are not conducive for fulfilling sustainable forest management. Weak accountability structure, poor community participation and transparency in decision-making, bureaucratic apathy, corruption, elites capturing the devolved power, and inequitable resource distribution reflected the contesting powers and interest of policymakers, policy implementers, and the recipient of these policies (Hyman 1983; Dahal 2006).

We realized that every individual, particularly our behavior toward the environment, heavily impacts the Anthropocene. Arguably, all these are just the superficial concerns that mirror the root problem—the evolution of the human-environment relationship. Factors such as industrialization, globalization, and commoditization created an environment that affected the perception and behavior of man toward his environment. Human connection with the environment now barely exists, making it easier to neglect or compromise the environment. Seemingly, these changes can, at some point, be observed in everyone. Further, these contemporary problems in this new epoch, such as the concerns on climate change and global warming, have seemingly become apparent beyond the boundaries of the forestry sector.

The good news is that there are ways to address this problem. Through responsive policies and programs anchored on good governance principles, it is still possible to generate positive and beneficial changes if they will be strategically set, implemented, monitored, evaluated, and regularly updated to cope with the changes in society and the environment. An integrated approach that harmonizes the efforts from various sectors at all levels is a critical factor that must be put in place. This can be complemented with the wise use of science and technology, including the integration of indigenous knowledge and practices toward a better understanding of how humans can live in harmony with nature. A strong will to change behaviors is also a crucial factor, since it is not just quantitative changes in the environment that count, but more so the individual decisions that are strongly tied with the institutional, political, economic, and cultural contexts bound also to the broad historical and global trends. That decision lies freely in each one of us, and hopefully, collectively as a nation, we can make changes that can help protect the Earth through responsible use and stewardship as we pursue a more sustainable path to growth and development.

## Notes

1. The Neolithic Age or the New Stone Age is the new period that started after the Pleistocene (Ice Age). The appearance of new working tools, including polished stone tools that differ from the Paleolithic Age (Old Stone Age), suggested the beginning of this period. It was during this time that humans started cultivating their land for food (Peralta and NCCA 2000).
2. The Holocene (meaning wholly recent) pertains to the most recent interval of Earth's history, including the present day, and is the quaternary period in the Cenozoic era. It began approximately 2.5 million years ago after the Pleistocene. It was during this age that *Homo sapiens* were distributed globally and signaled the start of the Neolithic Age (Callicott 2017; Pillans and Gibbard 2012).
3. The period before the Middle Ages
4. This type of cultivation is usually done at the start of the dry season and begins with the clearing of the forest by slashing down the vegetation. Debris are dried and burned before the start of the wet season. Tubers like gabi may be planted afterward while other crops are planted after the first rain to aid in the softening of the soil. After periods of planting, the plot will be fallowed for about ten years to recover the fertility of the soil through natural regeneration. During the fallow period, another area will be cleared and cultivated, and the same cycle repeats. Modern studies prove that traditional kaingin is more efficient than wet agriculture in terms of yield and cultivation effort (Peralta 2000).
5. Age of Discovery refers to the time when western countries were motivated to explore the world for the purpose of power, territorial expansion, and control over natural resources of the eastern countries (Heffner 1918).

6. The Regalian Doctrine vested the Spanish crown with the ownership of all lands, including the forest and forestlands (Buendia 1993).
7. The galleon trade is one of the Spanish economic policies that heralded the start of the globalized world economy. Two galleon ships sailed from the port of Manila, Philippines to Acapulco, Mexico containing products from Asia such as precious stones, ivory, cotton, silk, jade, iron, sandalwood, and porcelain, and then came back to Manila with the American silver (Amano et al. 2020).
8. The mercantile era is based on the economic doctrine that the stocks of gold and silver are the country's measurement of wealth and power. This doctrine compelled the Spanish colonizers to extract enormous amount of gold and silver from the Philippine forest. Extracted gold and silver was traded with other western countries such as the Americas through the galleon trade (Abueg 2017).
9. The encomienda system was a policy attempting to reconcile the needs of elites because of labor shortage and the need for laborers for protection.
10. The western concept of forest management mainly relies on the scientific knowledge that promotes the mechanization on the forestry sector, primarily with the goal of maximizing the economic productivity of the forest area (Top 2003).
11. Forestry Administrative Order No. 14 permits residents of the municipalities to cut, collect, and remove forest products without any forest charges.
12. Extensive kaingin greatly differs from the sustainable kaingin system practiced by the IPs. This new practice originated from the concepts of sedentary agriculture. After the loss of the primary forest due to timber extraction, upland farmers practiced the slash-and-burn concept in these degraded forests, which are now dominated with second-growth forest. Some of the farmers retained the practice of crop rotation, short fallow periods, or the burning of fallow; however, this new kaingin system is no longer grounded by the principle of harmony and sustainability, but production and demand.
13. Great Acceleration is the period after World War II notable for the sharp increase of the rate of human activities which significantly alter the global environment, such as the sudden population boom, increasing consumption of petroleum, rise in atmospheric greenhouse gas concentrations, and land conversion, among others.
14. Philippine mahogany is the trade name for the softer members of the dipterocarp family and is divided into two groups: dark-red and light-red lauan. Dark-red Philippine varieties are composed of the red lauan: tanguile (*Shorea polysperma*), tiaong (*S. ovata*), true red lauan (*S. negronensis*) and *S. teysmanniana*. Light-red Philippine mahogany includes the white lauan: real white lauan (*S. contorta*), almon (*S. almon*), *S. eximia*, bagtikan (*Parashorea spp.*), manggasinoro (*S. assamica*), *Dacryodes incurvata*, kalunti (*S. kalunti*), and mayapis (*S. palosapis*) (Tamesis 1948).

## References

- Abueg, L. C. 2017. An Econometric History of Philippine Trade: 1810–1899. *DLSU Business & Economics Review* 26 (2): 125–46.
- ADB (Asian Development Bank). 2002. Indigenous Peoples/Ethnic Minorities and Poverty Reduction. Manila: ADB. <http://hdl.handle.net/11540/2965>.
- . 2009. *Poverty in the Philippines: Causes, Constraints, and Opportunities*. Mandaluyong: ADB.
- Amano, N., G. Bankoff, D. M. Findley, G. Barretto-tesoro, and P. Roberts. 2020. Archaeological and Historical Insights into the Ecological Impacts of Pre-colonial and Colonial Introductions into the Philippine Archipelago. *Holocene* 31 (2). <https://doi.org/10.1177/0959683620941152>
- Anderson, E. A. 1976. The Encomienda in Early Philippine Colonial History. *Asian Studies* 14 (2): 25–36.
- Bacalla, D. T. 2006. Promoting Equity: A Challenge in the Implementation of Community-Based Forest Management Strategy in the Philippines. In *Hanging in the Balance: Equity in Community-Based Natural Resource Management in Asia*, edited by S. Mahanty, J. Fox, M. Nurse, P. Stephen, and L. McLees, 162–181. Bangkok: RECOFTC. <https://www.eastwestcenter.org/publications/hanging-in-the-balance-equity-in-community-based-natural-resource-management-in-asia>.
- Bedard, P. W. and P. N. Ylvisaker. 1957. *The Flagstaff Federal Sustained Yield Unit*. Tuscaloosa, AL: ICP/University of Alabama Press.
- Boado, E. L. 1985. Forestry in Development: Philippines and Malaysia. PhD diss., State University of New York. UMI Dissertation Information Service.
- . 1988. Incentive Policies and Forest Use in the Philippines. In *Public Policies and the Misuse of Forest Resources*, edited by R. Repetto and M. Gillis, 165–204. Cambridge: Cambridge University Press. <https://doi.org/10.1017/cbo9780511601125.005>.
- Buendia, R. 1993. Colonialism and Elitism in Philippine Political Development: Assessing the Roots of Underdevelopment. *Philippine Journal of Public Administration* 37 (2): 141–174.
- Cagalanan, D. 2015. Governance Challenges in Community-Based Forest Management in the Philippines. *Society and Natural Resources* 28 (6): 609–624. <https://doi.org/10.1080/08941920.2014.948242>.
- Camacho, L. D., D. T. Gevaña, A. P. Carandang, and S. C. Camacho. 2016. Indigenous Knowledge and Practices for the Sustainable Management of Ifugao Forests in Cordillera, Philippines. *International Journal of Biodiversity Science, Ecosystem Services and Management*, 12 (1–2): 5–13. <https://doi.org/10.1080/21513732.2015.112445>.
- Caputo, J. 2012. Commoditization and the Origins of American Silviculture. *Bulletin of Science, Technology & Society* 32 (1): 86–95. <https://doi.org/10.1177/0270467612444582>.
- Carandang, A. P., L. A. Bugayong, P. C. Dolom, L. M. Garcia, M. M. B. Villanueva, N. O. Espiritu. 2012. Analysis of Key Drivers of Deforestation and Forest Degradation in the Philippines. Manila: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
- Casiro, R. B. and E. T. Catubig. 2019. Paper Industries Corporation of the Philippines (PICOP): Its History and Socio-economic Impact in Bislig, City, Surigao del Sur. Paper Presentation, International Conference on Public Organization, Asia Pacific Society for Public Affairs. 28–30 August, Khon Kaen Province, Thailand.
- Callicott, J. B. 2017. Environmental Ethics. In *Encyclopedia of the Anthropocene* 4: 1–10. <https://doi.org/10.1016/B978-0-12-809665-9.10303-9>.
- Chenery, H. B., M. S. Ahluwalia, C. L. G. Bell, J. H. Duloy, R. Jolly. 1974. *Redistribution with Growth: Policies to Improve Income Distribution in Developing Countries in Context of Economic Growth*. London: World Bank, Institute of Development Studies–University of Sussex, and Oxford University Press.
- Chokkalingam, U., A. P. Carandang, J. M. Pulhin, R. D. Lasco, R. J. Peras, and T. Toma, eds. 2006. *One Century of Forest Rehabilitation in the Philippines: Approaches, Outcomes*

- and Lessons.* Bogor, Indonesia: Center for International Forestry Research. <https://doi.org/10.17528/cifor/002025>.
- Cruz, G. R. C. 2019. A Review of How Philippine Colonial Experience Influenced the Country's Approaches to Conservation of Cultural Heritage. Paper Presentation, 12th De La Salle University Arts Congress, Manila, Philippines.
- Cuizon, R. O. 2007. Community-based Forest Management Policy and the Cultural Practices of the Sama Tribe. *Liceo Journal of Higher Education Research* 5 (1): 154–161. <https://doi.org/10.7828/ljher.v5i1.9>.
- Cola, R. M. 2002. Customary Laws on Biodiversity Conservation Among the Tagbanwa of Palawan. *Ateneo Law Journal* 47: 753–77.
- Dahal, G. R., and D Capistrano. 2006. Forest Governance and Institutional Structure: An Ignored Dimension of Community Based Forest Management in the Philippines. *International Forestry Review* 8 (4): 377–394.
- De Guzman, M. V. and D. Dinopol. 2002. Partnerships for Development in Mt. Guiting-guiting: Delineation of Ancestral Domains and Resource Management Planning by the Mangyan Tagabukid of Sibuyan. *Ateneo Law Journal* 47: 659–93.
- Delina, L. L. 2021. Topographies of Coal Mining Dissent: Power, Politics, and Protests in Southern Philippines. *World Development* 137 (105194). <https://doi.org/10.1016/j.worlddev.2020.105194>.
- DENR-FMB (Department of Environment and Natural Resources–Forest Management Bureau). Philippine Forestry Statistics for the years 1990–1998, 2000, 2004, 2005, 2007, 2010, 2015, 2018, and 2019. <https://forestry.denr.gov.ph/index.php/statistics/phillippines-forestry-statistics>.
- Douai, A. and M. Montalban. 2009. Institutions and the Environment: the Case for a Historical Political Economy. *Cahiers du GRES* (4). <https://ideas.repec.org/p/grs/wpegrs/2009-07.html>.
- Douai, A. and M. Montalban. 2009. Institutions and the Environment: the Case for a Historical Political Economy. *Cahiers du GRES* (4). <https://ideas.repec.org/p/grs/wpegrs/2009-07.html>.
- Durst, P., C. Brown, J. Broadhead, R. Suzuki, R. Leslie, and A. Inoguchi, eds. 2008. Re-inventing Forestry Agencies: Experiences of Institutional Restructuring in Asia and the Pacific. Bangkok: FAO Regional Office for Asia and the Pacific. <http://www.fao.org/docrep/010/ai412e/AI412E01.htm>.
- Geist, H. J., and E. F. Lambin. 2002. Proximate Causes and Underlying Driving Forces of Tropical Deforestation. *BioScience* 52 (2): 143–150. [https://doi.org/10.1641/0006-3568\(2002\)052\[0143:PCAUDF\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[0143:PCAUDF]2.0.CO;2).
- Hahn, T., C. McDermott, C. Ituarte-Lima, M. Schultz, T. Green, and M. Tuvendal. 2015. Purposes and Degrees of Commodification: Economic Instruments for Biodiversity and Ecosystem Services Need Not Rely on Markets or Monetary Valuation. *Ecosystem Services* 16, 74–82. <https://doi.org/10.1016/j.ecoser.2015.10.012>.
- Heffner, M. 1918. Does Colonization Pay? *The Journal of Race Development* 8 (3): 354–365. <https://www.jstor.org/stable/29738246>.
- Hetemäki, L., G. Mery, M. Holopainen, J. Hyypää, L. M. Vaario, and K. Yrjälä. 2010. Implications of Technological Development to Forestry. In *Forests and Society—Responding to Global Drivers of Change*, edited by G. Mery, P. Katila, G. Galloway, R. I. Alfaro, M. Kanninen, M. Lobovikov, and J. Varjo, 157–182. Vienna: IUFRO. <https://www.iufro.org/science/wfse/forests-society-global-drivers/>.
- Huntjens, P. and K. Nachbar. 2015. Climate Change as a Threat Multiplier for Human Disaster and Conflict: Policy and Governance Recommendations for Advancing Climate Security. *The Hague Institute for Global Justice Working Paper Series* 9. <https://www.thehagueinstituteforglobaljustice.org/portfolio/climate-change-as-a-threat-multiplier-for-human-disaster-and-conflict/>.
- Hyman, E. L. 1983. Forestry Administration and Policies in the Philippines. *Environmental Management* 7 (6): 511–523.

- ILO (International Labour Organization). 1995. *Indigenous Knowledge System and Practices among Selected Philippine Ethnic Groups and their Promotion Through Cooperatives*. Manila: ILO. [https://www.ilo.org/manila/publications/WCMS\\_542426/lang--en/index.htm](https://www.ilo.org/manila/publications/WCMS_542426/lang--en/index.htm).
- Jili'ow, A. I. 2017. Policy, Difference Between Policy and Procedure, Types of Policy, Characteristics of Policy, Policy Analysis Approaches, Stages of Policy Cycle & Policy Making Process. MA thesis, Open University Malaysia.
- Jones, A. W. and R. S. Kennedy. 2008. Evolution in a Tropical Archipelago: Comparative Phylogeography of Philippine Fauna and Flora Reveals Complex Patterns of Colonization and Diversification. *Biological Journal of the Linnean Society* 95 (3): 620–639. <https://doi.org/10.1111/j.1095-8312.2008.01073.x>.
- Laffoley, D. and J. M. Baxter, eds. 2016. *Explaining Ocean Warming: Causes, Scale, Effects and Consequences*. Gland, Switzerland: IUCN. <https://www.iucn.org/news/marine-and-polar/201609/explaining-ocean-warming-causes-scale-effects-and-consequences>.
- Lasco, R. D., R. G. Visco, and J. M. Pulhin. 2001. Secondary Forests in the Philippines: Formation and Transformation in the 20th Century. *Journal of Tropical Forest Science* 13 (4): 652–670.
- Lasco, R. D. and F. B. Pulhin. 2000. Forest Land Use Change in the Philippines and Climate Change Mitigation. *Mitigation and Adaptation Strategies for Global Change* 5 (1): 81–97. <https://doi.org/10.1023/A:1009629220978>.
- Lewis, S. L. and M. A. Maslin. 2015. Defining the Anthropocene. *Nature* 519 (7542): 171–180. <https://doi.org/10.1038/nature14258>.
- Lynch, O. J. 1986. Philippine Law and Upland Tenure. In *Man, Agriculture and the Tropical Forest: Change and Development in the Philippine Uplands*, edited by S. Fujisaka, P. E. Sajise, and R. A. del Castillo, 269–92. Bangkok: Winrock International Institute for Agricultural Development.
- Magcal-a-Macandog, D. B. and L. J. M. Ocampo. 2005. Indigenous Strategies of Sustainable Farming Systems in the Highlands of Northern Philippines. *Journal of Sustainable Agriculture* 26 (2): 117–138. [https://doi.org/10.1300/J064v26n02\\_09](https://doi.org/10.1300/J064v26n02_09).
- Malhi, Y. 2017. The Concept of the Anthropocene. *Annual Review of Environment and Resources* 42 (1): 77–104. <https://doi.org/10.1146/annurev-environ-102016-060854>.
- Malhi, Y., T. A. Gardner, G. R. Goldsmith, M. R. Silman, and P. Zelazowski. 2014. Tropical Forests in the Anthropocene. *Annual Review of Environment and Resources*, 39 (1): 125–159. <https://doi.org/10.1146/annurev-environ-030713-155141>.
- NAMRIA (National Mapping and Resource Information Authority). Land Cover Map of the Philippines for the years 2010 and 2015. <http://namria.gov.ph/>.
- OHCHR (Office of the High Commissioner for Human Rights). 2019. Global Extractivism and Racial Equality. Geneva: UN. 41–54.
- Official Gazette. Presidential Decree No. 705, s. 1975. Revising Presidential Decree No. 389, Otherwise Known as the Forestry Reform Code of the Philippines. <https://www.officialgazette.gov.ph/1975/05/19/presidential-decree-no-705-s-1975/>.
- Panegro, P. M., and F. C. Bulatao. 2002. Claims and Counterclaims in the Mt. Halcon and Mt. Calavite Ranges: The Iraya Peoples Assertion of Rights to Their Ancestral Domains. *Ateneo Law Journal* 47: 624–658.
- Peralta, J. T. 2000. *Glimpses: Peoples of the Philippines*. Manila: National Commission for Culture and the Arts.
- PSA (Philippine Statistics Authority). Philippine Statistical Yearbook for the years 1990, 1995, 2000, 2005, 2010, and 2018. <https://psa.gov.ph/products-and-services/publications/philippine-statistical-yearbook>.
- Pillans, B. and P. L. Gibbard. 2012. The Quaternary Period. *The Geologic Time Scale* 2: 979–1010. <https://doi.org/10.1016/B978-0-444-59425-9.00030-5>.
- Poffenberger, M. and B. McGean. 1993. Upland Philippine Communities: Guardians of the Final Forest Frontiers, Research Network Report No. 4. Berkeley, CA: UC Berkeley Center for Southeast Asia Studies.

- Prall, D. 2018. Between a Rock and a Hard Place. *American City and County* 133 (3): 14–21. <https://doi.org/10.2307/j.ctt9qh62v.7>
- Pulhin, J. M. 1996. Community Forestry: Paradoxes and Perspectives in Development Practice. PhD diss., The Australian National University.
- . 2002. Trends in Forest Policy in the Philippines. *Policy Trend Report*, 29–41. [http://pub.iges.or.jp/modules/envirolib/upload/371/attach/03\\_Philippines.pdf](http://pub.iges.or.jp/modules/envirolib/upload/371/attach/03_Philippines.pdf).
- Pulhin, J. M., M. C. Amaro, and D. Bacalla. 2005. Philippines Community-Based Forest Management: A Country Report. In *Regional Community Forestry Forum: Regulatory Frameworks for Community Forestry in Asia*, edited by N. O'Brien, S. Mathews, and M. Nurse. Proceedings of Regional Forum held in Bangkok, Thailand, 24–25 August, 85–100.
- Pulhin, J. M. M. Inoue, and T. Enters. 2007. Three Decades of Community-Based Forest Management in the Philippines: Emerging Lessons for Sustainable and Equitable Forest Management. *International Forestry Review* 9 (4): 865–883. <https://doi.org/10.1505/ifor.9.4.865>
- Pulhin, J. M., and M. A. M. Ramirez. 2005. Behind the Fragile Enterprise: Community-based Timber Utilization in Southern Philippines. Rights and Resources Initiative. <https://rightsandresources.org/wp-content/exported-pdf/nppfrdcphilippinescfecasesstudy.pdf>.
- Ramirez, M. A. M., A. M. Lecciones, and X. G. B. Capiña. 2019. *Social Forestry in the ASEAN Region: Gaps and Strategic Interventions*. Los Baños: SEARCA. <https://www.searca.org/pubs/monographs?pid=445>.
- Rebugio, L. L. 1995. Social Forestry: One View from the Academe. Paper presented during the National Curriculum Development Workshop in Social Forestry, Institute of Forest Conservation, University of the Philippines Los Baños.
- Rebugio, L. L., J. Pulhin, A. Carandang, E. Peralta, L. Camacho, and Bantayan. (2016). Forest Restoration and Rehabilitation in the Philippines. *Keep Asia Green*, vol. 1, 125–169. <https://www.iufro.org/science/special/spdc/actpro/keep/sea/>.
- Red Cross and IFRC (International Federation of Red Cross and Red Crescent Societies). 2016. Information Bulletin Philippines: Drought and Dry Spells. <https://www.ifrc.org/docs/Appeals/16/IBPHdr290416.pdf>.
- Rosa, E., T. Rudel, R. York, A. Jorgensen, and T. Dietz. 2015. The Human (Anthropogenic) Driving Forces of Global Climate Change. *Etica e Politica* 15 (1): 583–605. <https://doi.org/10.1093/acprof:oso/9780198708520.003.0001>.
- Rott, N. 2020. "Like Poking a Beehive": The Worrisome Link Between Deforestation and Disease. *NPR*. 22 June. <https://www.npr.org/2020/06/22/875961137/the-worrisome-link-between-deforestation-and-disease>.
- Sajise, P. E. 1994. Forest Policy in the Philippines: A Winding Trail Toward Participatory Sustainable Development. In *A Step Toward Forest Conservation Strategy (+): Current Status on Forests in The Asia-Pacific Region (Interim Report +332)*. Tokyo: The Institute for Global Environmental Strategies (IGES). [https://www.iges.or.jp/en/publication\\_documents/pub/researchreport/en/740/ir98-3-16.pdf](https://www.iges.or.jp/en/publication_documents/pub/researchreport/en/740/ir98-3-16.pdf)
- Santos, C. T., L. Toda, J. R. Orduña, F. D. Santos, and J. Ferrão. 2015. The Impacts of Typhoon Haiyan in the Philippines: Implications to Land Use Planning. *Climate, Disaster and Development Journal* 1 (1): 57–66. <https://doi.org/10.18783/cddj.v001.i01.a06>.
- Schnaiberg, A. 1980. *The Environment: From Surplus to Scarcity*. New York: Oxford University Press.
- Seneviratne, S. I., N. Nicholls, D. Easterling, C. M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang. 2012. Changes in Climate Extremes and Their Impacts on the Natural Physical Environment. In *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*, edited by C. B. Field, V. Barros, T. F. Stocker, D. Qin, D. J. Dokken, K. L. Ebi, M. D. Mastrandrea, K. J. Mach, G. K. Plattner, S. K. Allen, M. Tignor, and P. M. Midgley, 109–230. Cambridge and New York: Cambridge University Press.

- Steffen, W., P. J. Crutzen, and J. R. McNeill. 2007. The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature? *Ambio* 36 (8): 614–621. [https://doi.org/10.1579/0044-7447\(2007\)36\[614:TAAHNO\]2.0.CO;2](https://doi.org/10.1579/0044-7447(2007)36[614:TAAHNO]2.0.CO;2)
- Steffen, W., J. Grinevald, P. Crutzen, and J. McNeill. 2011. The Anthropocene: Conceptual and Historical Perspectives. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369 (1938). <https://doi.org/10.1098/rsta.2010.0327>.
- Sonter, L. J., D. Herrera, D. J. Barrett, G. L. Galford, C. J. Moran, and B. S. Soares-Filho. 2015. Mining Drives Extensive Deforestation in the Brazilian Amazon. *Nature Communications* 8. <https://doi.org/10.1038/s41467-017-00557-w>.
- SUDECOR (Surigao Development Corporation). 2017. Flawed Logic in Natural Resource Utilization and Management. Presentation at the Philippine Press Institute's Seminar-Workshop on Valuation of Natural Capital, Almont Hotel, Butuan City.
- Tamesis, F. 1948. Philippine Forests and Forestry. *Unasylva* 2 (6).
- Teodoro, L. J. 1981. From Revolution to Annexation: Historical Overview of the Philippines. In *Out of His Struggle: The Filipinos in Hawaii*. 1–5. Honolulu: University of Hawai'i Press.
- Top, G. van den. 2003. *Social Dynamics of Deforestation in the Philippines*. Copenhagen: Nordic Institute Asian Studies Press.
- Uebelhör, B., B. Lagundino, and R. Abalus. 1990. Appraisal of the Philippine Selective Logging System, Technical Report No. 7. Philippine-German Dipterocarp Forest Management Project PN 88.20474. Quezon City: DENR.
- UNISDR (United Nations International Strategy for Disaster Reduction). 2008. Climate Change and Disaster Risk Reduction: Weather, Climate and Climate Change. [http://www.unisdr.org/files/4146\\_ClimateChangeDRR.pdf](http://www.unisdr.org/files/4146_ClimateChangeDRR.pdf)
- Vitug, M. D. 1993. *Power from the Forest: The Politics of Logging*. Quezon City: Philippine Center for Investigative Journalism.
- Westoby, J.C. 1962. Forest Industries in the Attack on Economic Underdevelopment. In *The State of Food and Agriculture*, 247–249. Rome: FAO.
- World Bank (2020). Philippines Carbon (CO<sub>2</sub>) Emissions 1960-2021. Retrieved from: [datatopics.worldbank.org](http://datatopics.worldbank.org)
- WCED (World Commission on Environment and Development). 1987. Report of the World Commission on Environment and Development: Our Common Future. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>.
- Zapico, F. L., C. H. Aguilar, A. Abistano, J. C. Turner, and L. J. Reyes. 2015. Biocultural Diversity of Sarangani Province, Philippines: An Ethno-Ecological Analysis. *Rice Science* 22 (3): 138–146. <https://doi.org/10.1016/j.rsci.2015.05.018>.



# A NETWORKED LANDSCAPE?: Using Relational Structures to Examine the Implementation of Community-Based Forestry Projects in the Kalatungan Mountain Range

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## Abstract

Over the last three decades, billions of metric tons of anthropogenic greenhouse gases have been released into the atmosphere as a result of deforestation. In the same period, forests overlaying indigenous peoples' land demonstrate the highest levels of biodiversity conservation, hinting at the value of their practices for forest conservation. Worldwide, indigenous peoples leverage different knowledge bases, including scientific and indigenous knowledge systems and practices, to sustain their forests. Their ability to steward their ancestral lands may be enhanced by building and leveraging partnerships within the context of community-based forestry. These efforts may be enhanced by applying social network theories and tools. This chapter illustrates how social network analysis (SNA) can be used as a project evaluation tool from the outset and in intervals of indigenous peoples' forestry projects. It applies this approach to two projects which engage with six community-based forestry initiatives in the Kalatungan Mountain Range. Probing into the relationship between local and landscape-wide action, this chapter aims to shed light on the social structures and positional qualities that facilitate leadership and collaboration in forest governance.

## Introduction

Climate change is expected to severely impact forest systems. Recent forest fires in the Amazon, Australia, and California offer sobering evidence of the threat that a warming climate constitutes for forest systems and the people living in or near forests. Changing climate conditions are expected to raise the frequency and intensity of forest disturbances (e.g., fires, drought, and flooding) and to change land use patterns (Canadell et al. 2009; Thomas et al. 2004; Bonan 2008; Asner et al. 2015). At the same time, deforestation accelerates climate change. In the last three decades alone, billions of metric tons of anthropogenic greenhouse gases have been released into the atmosphere as a result of deforestation. Worldwide, policy communities have mobilized in search of effective policy instruments to address deforestation.

Community-based forestry (or community forestry) is one instrument that has been put forward to halt and perhaps reverse deforestation. Community forestry places forest governance in the hands of forest dwelling communities. It aims to empower forest-dwelling communities to take action on deforestation while generating sustainable livelihoods (Kellert et al. 2000; Ribot 2009). In so doing, community forestry may liberate forest governance from restrictive and inefficient bureaucracies and spur policy innovations that are tailored to resource user needs, promote social justice, and amplify forest systems' adaptive capacity (Armitage 2005, Kellert et al. 2000).

In the Philippines, community forestry was established in 1995 as "the national strategy to achieve sustainable forestry and social justice" through Executive Order No. 263 (McDermott 2001, 32). While some note its potential to amplify forest conservation and biodiversity (Lasco and Pulhin 2006), community forestry's implementation has largely been inadequate (Pulhin et al. 2007). Most empirical studies suggest that community forestry can be a costly rather than economically liberating for Filipino forest dwelling communities (Lasco 2010; Shackleton et al. 2002). Community forestry, it has been argued, enables the Filipino elite to maintain power, capture economic benefits, and disproportionately burden local resource users (Li 2002). While observing the inadequacies of community forestry implementation in the Philippines, Pulhin and Inoue (2008) argue that it still offers some valuable lessons, especially when community forestry lies at the interface of community forestry and indigenous peoples' governance.

Indigenous peoples (IPs) manage an estimated 11 percent of the world's forests (Sobrevila 2008). They contribute greatly to the conservation of forested land (Garnett et al. 2018), and since they live and harvest directly from forests, IPs are expected to be acutely impacted by climate change (Abate and Kronk 2013; Erni 2015; Green and Raygorodetsky 2010; Norton-Smith et al. 2016; Suich et al. 2015). Climate change is already impacting Filipino forest-dwelling indigenous communities. The Higaonon people in Misamis Oriental report that climate change distorts the "nature signals" which they

have used for generations to guide their spiritual and livelihood practices (de la Peña et al. 2017). In this regard, one interesting case study is the Kalatungan Mountain Range where forest governance increasingly involves a specific type of community forestry, one that dually leverages scientific and indigenous knowledge systems and practices (IKSP).

As a point of departure, this chapter takes the idea that IKSP serve as an effective yet poorly understood basis for community-based forestry. We agree with Linda Robyn that the continued neglect of IKSP in mainstream environmental conservation praxis constitutes

a grave injustice because it is socially injurious to Native peoples and, in effect, all people . . . When writing about Indigenous peoples, the exclusion of environmental issues also establishes an injustice because it does not recognize the origins of social institutions among all human beings. (2002, 198)

While a formal movement to raise recognition about the legitimacy of IKSP as a basis for knowledge and practice has been underway at least since the 1992 UN Conference on Environment and Development, it has not yet gained sufficient ground in mainstream policymaking. One handicap is inadequate knowledge about the relational dynamics within communities of practice. To address this challenge, we employ a mixed-method research design which centers around a series of social network analyses (SNA), which are increasingly being used to study the governance of socio-ecological systems like forests (Newig et al. 2010; Sandström and Rova 2010; Ernsten et al. 2008). While scholars have argued that SNA would be a useful tool for designing, implementing, and evaluating projects (Valente et al. 2015; Bodin and Prell 2011; Prell et al. 2009), it is rarely used in this way. We address this gap by leveraging SNA to demonstrate how knowledge of social networks can assist project managers in designing programs that improve cross-cultural collaboration within the context of forestry, thus helping amplify the impacts of evidenced-based forest governance initiatives.

In what follows, we briefly discuss our method of study before launching into a description of our case study: the Kalatungan Mountain Range. Then we demonstrate how SNA can be used in combination with interviews, surveys, and document analysis to reveal intervention opportunities within the forest landscape. We also apply SNA to reveal how indigenous peoples' capacities for community forestry are determined in part by the structure of social relations embedded in their cultures. We also provide some recommendations for enhancing indigenous peoples' forestry and discuss our findings before ending with a summary of the chapter's main conclusions.



## Using Network Analysis to Examine Forest Conservation in the Philippines

The Forest Foundation Philippines is a non-profit organization that was established under two bilateral agreements between the governments of the United States and the Philippines. At the time of this writing, the Forest Foundation has supported hundreds of projects which have contributed to the restoration of 4,200 hectares of forests, established 40 community forestry projects, helped improve the management of 1.5 million hectares of forested land, and helped support more than 60 community enterprises.

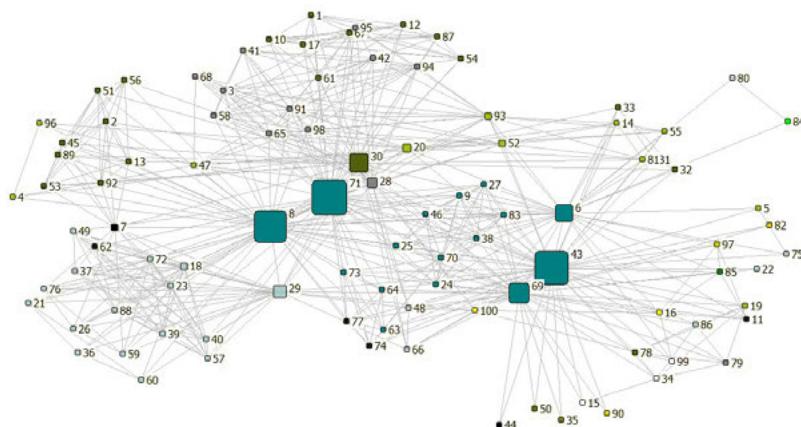
This chapter focuses on Forest Foundation-supported programs in Misamis Oriental and Bukidnon. We combine interviews, surveys, document analysis, and social network analysis in our study. Text analysis was conducted using the computer program ATLAS.ti, while network analysis was conducted using the software environment R. Knoke and Yang define social networks as “structures composed of a set of actors, some of whose members are connected by a set of one or more relations.” (2008, 8) SNA employs a mix of graph theory and data visualization techniques to study a range of social systems, from families to international NGOs (Borgatti et al. 2009).

The networks we analyze are built using a two-step approach. As our first step, we employed SNA-based stakeholder analysis (Prell et al. 2008) to develop a sampling frame. We began by performing a document analysis on 167 documents made available by the Forest Foundation from which we selected two ongoing projects that met the following criteria: (1) the aim of building the capacity of indigenous peoples to govern their forests; (2) the project being implemented in the Kalatungan Mountain Range; and (3) the project managers being sufficiently well connected in the region. The selected projects are each managed by the Xavier Science Foundation (XSF) and the Mindanao Integrated Management Foundation (MINMAF). XSF’s project aims to build capacity through reforestation and conservation, while MINMAF’s aims to build capacity through knowledge generation. We contacted the eight Lumad indigenous peoples organizations (IPOs) identified in the documents and six agreed to participate in the study (see Table 1).

**TABLE 1.** Participating Indigenous Peoples Organizations

	LOCAL GOVERNMENT UNIT	CULTURAL ROOT	FOREST FOUNDATION SUPPORTED PARTNER
Bayawon, Lungayan, Lukday, Pendonay, Tandakol Tribal Association (BLLUPENTTRAS)	Lilingayon	Talaandig	XSF
Catal Lumad Development Association (CALUDA)	La Roxas	Talaandig	XSF
Manggayahay Talaandig Tribal Association (MANTALA)	Mt. Nebu	Talaandig	XSF & MINMAF
Miarayon-Lapok-Lirongan-Tinaytayan-Talaandig Tribal Association (MILALITTRA)	Miarayon, Lapoc, Lirongan, San Miguel	Talaandig	XSF & MINMAF
Nagkahiusang mga Manubong Manununod sa Yutang Kabilin (NAMAMAYUK)	Bacusanon	Manobo	XSF & MINMAF
Portulin Talaandig Tribal Association (PTTA)	Portulin	Talaandig	XSF & MINMAF

**FIGURE 1.** XSF project network



**FIGURE 2.** MINMAF project network

We constructed networks using 21 documents from XSF and 12 documents from MINMAF. Figures 1 and 2 are network visualizations of the stakeholder networks built through this process. In these visualizations, the size of each node measures its betweenness centrality score, which captures each node's importance for connecting other members of the nodes to each other.

A list of interviewees was drawn from the stakeholder networks using each potential interviewee's betweenness centrality. Actors with high betweenness centrality scores are assumed to know the details of community forestry because they are in the “eye of the storm”; median betweenness centrality scores reflect that the actors are involved, albeit not intimately, so they may have a more holistic vision of community forestry; and low betweenness centrality scores indicate that this individual may be able to reflect (1) barriers to participation, and (2) untapped resources. As our second step, we interviewed these individuals to build the networks used for the analyses.

**TABLE 2.** Data Collection Protocol

DOCUMENT ANALYSIS		
Number of documents analyzed: 167		Number of independent verifications: 10
Interviews		
Targets		
Round 1	Forest Foundation Partners and their teams	15
Round 2	IPO leaders, Forest Foundation partners, other resource people	18

TABLE 2 (CONT'D)

	CALUDA	9
	BLUPPENTRAS	13
Round 3 (N=62)	MILALITTRA	10
	MANTALA	10
	PTTA	8
	NAMAMAYUK	12

Interviews were conducted in three rounds. In the first two rounds we performed in-person and phone interviews. These rolling interviews lasted over a nine-month period (see Table 2). After performing a text analysis of the first two sets of interviews, we conducted a third set of interviews which combined traditional name-generator surveying techniques with open-ended questions. For this final round, we specifically sought to speak with actors at the frontlines (forest guards and community elders) for these final set of interviews ( $N = 62$ ). The results of all these analyses are reported in the succeeding sections. In the next part, we describe the governance landscape in Mount Kalatungan. This description is informed by a review of the literature, document analysis, and interview records.

Representation of almaciga or Manila copal, *Agathis philippinensis*

### Challenges and Opportunities for Indigenous Peoples' Community Forestry in and Across the Kalatungan Mountain Range

"As expressed by our ancestors, we are part of nature and must begin to express an idea of community rather than conquest. Native teachings can help us understand our relationship with life and creation as well as expand our awareness of nature and natural cycles. We can begin to see that the earth is a resource for all our needs, in fact, our only resource."

(Robyn 2002)

Rising as much as 2,824 meters above sea level and spread across an expanse of some 213 km<sup>2</sup>, the Kalatungan Mountain Range is one of the few places left in the Philippines where old growth forests can still be found. Mount Kalatungan is an active volcano and the mountain range spans three municipalities and one city in the province of Bukidnon: Talakag, Maramag, Pangantucan, and Valencia City. The mountain range's forests are important carbon sinks (Lasco and Pulhin 2000) that mitigate climate catastrophes. They also house substantial biodiversity—a key biodiversity area, in fact—and some critical watersheds. Four river basins flow through the mountain range (Pulangi, Cagayan, Muleta, and Maridugao rivers) which connect the landscape to over 35 river systems. These forests also prevent soil degradation and flooding; thus, their absence is consequential for downstream communities. The value of these ecological services became apparent in December 2011 when Tropical Storm Sendong (Washi) tore through Northern Mindanao. Sendong caused the Cagayan de Oro river to overflow, resulting in 1,268 confirmed deaths. The scale of the devastation has been attributed to deforestation and catalyzed efforts to improve forest conservation in the Kalatungan Mountain Range. Because much of the forested land in Mount Kalatungan lies within the ancestral lands of Lumad peoples, they are ideal partners for these initiatives.

Indigenous peoples' status as stewards of the forest cannot be taken for granted. Forests are sites of material and symbolic struggles between actors with different status, wealth, claims to rights, and gender (Fortmann and Bruce 1988; Fortman 1985 cited in Sikor 2006), which manifest as conflicts based in competing claims to the forests that draw on different degrees of legitimacy (Sikor 2006). In this crowded institutional field, the Lumad also struggle against development aggression, violence from skirmishes between the military and rebel groups, poverty, and other outside influences.

The diffuse nature of authority, knowledge, and material resources in the landscape can make grassroots stakeholders, like indigenous peoples, feel powerless to address crucial, landscape-wide challenges (Bodin and Prell 2011). Crucial decisions may lay in the hands of elite actors who use their power to carve out rules that can run counter to their own institutions (Irvin and Stansbury 2004; Fisher et al. 2013; Kellert et al. 2000). During our study, for example, the IPOs that we observed were erecting tribal halls as part of a Forest Foundation-supported project. Tribal halls are considered a sacred space which custom dictates must be built with freshly harvested native trees because:

We will be placing the tribal rules inside that hall. That is where we will bring to life our history and our ancestor's legacy. (Subject 55)

However, harvesting native trees is illegal in the protected area. Moreover, the entire Philippines is under a nationwide logging moratorium. To address this problem, the project manager appealed to the Department of Environment and Natural Resources (DENR) so that the project might

leverage an exemption which allows planted trees to be harvested with the agency's approval. This example illustrates the reciprocity between the IPOs and the government in the landscape. These types of relationships provide opportunities to find support for community forestry. What is happening in the Kalatungan Mountain Range offers evidence that there may be alternatives to the problematic community forestry arrangements observed in other studies (e.g., Lasco 2010, Shackleton et al. 2002, Li 2002).



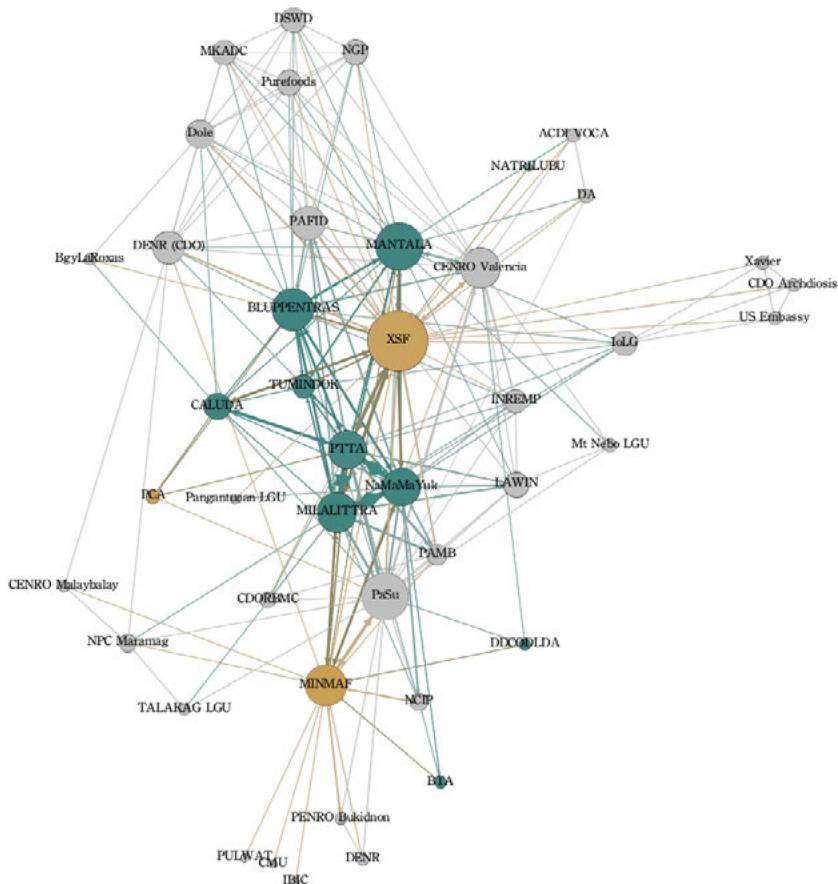
Representation of agila or Philippine eagle, *Pithecopaga jefferyi*

One thing that distinguishes the Lumad of the Kalatungan Mountain Range is that they have organized into a consortium, the Kalatungan Tribal Council. The council works alongside many formal and informal partners across the landscape to govern its forests. The Kalatungan Tribal Council is headed by leaders from PTTA (president), MILALITTRA (vice president), and NAMAMAYUK (secretary). It is an important forum for promoting community forestry initiatives:

I attribute a lot of success in that area to the tenacity of the head of the Kalatungan Tribal Council. To make progress, IPO leaders and elders left their fields for 2–3 days and their families suffered, believe me. Their labor input is so crucial to their families, that when they attend meetings their families really experience hardship. And for him to keep on pushing them to attend meetings, that shows vision and tenacity. (Subject 11)

Subject 56 tells us, “We [the chieftains of the IPOs that belong to the Council] are like cousins, like brothers.” This is reflected in Figure 3, which depicts the governance network that has emerged through the IPOs’ self-advocacy. In Figure 3, IPOs are represented by teal circles while Forest Foundation supported project managers are represented by gold circles. At the network’s center are PTTA, MILALITTRA, and NAMAMAYUK. Activities organized by actors at the landscape level constitute a second level of forest governance, the first level lies within the community. The Kalatungan Tribal Council represents the majority of the landscape’s IPOs at various platforms like the Protected Management Board (PAM-B), where important decisions are made about forest governance in the landscape.

According to interviewees, the collaboration and coordination that can be observed across the landscape today are fruits of the sacrifices made by indigenous peoples and of leaders like Subject 56, then-Protected Area Supervisor (PASu), Subject 144, and Subject 11 from the Philippine Association for Intercultural Development (PAFID). To illustrate, we



**FIGURE 3.** Network Map of IP Governance Structure

briefly describe the evolution of the relationship between the indigenous communities and the PASu.

Today, PASu of the DENR sees himself as an advocate for our six IPOs. To facilitate current relationships, both sides had to overcome significant barriers and a violent history, including the murder of a PASu by an indigenous person:

The park supervisor was killed by one of us. Yes, it was very hurtful . . . but before, when members of our community would build homes, he [the PASu] would incarcerate them. If there were outsiders that took our natural resources, he would allow them. But we did not hide the killer, because he needed to answer to the law. (Subject 57)

When the conflict was sparked, Subject 56 of a neighboring IPO recounts:

Although ours was the first of the applications for ancestral domain titles that [redacted] had processed and at that time, [the IPO that the assailant came from] was only in the second month of its Ancestral Domain claim, [Subject 144] spoke with me and the Task Force and requested that we put their claim first because it is a critical area. I agreed and said, “okay, let his go first.” (Subject 56)



Representation of rattan, *Daemonorops gracilis*

And then things improved further through the intermediation of Subject 144:

He asked us about our plans for the forest and we responded, “When it comes to protecting the forest, we won’t touch it because it is a sacred area.” He told us that it would be good if we could hold a dialogue with the barangay captain, mayor, and DENR so that we can harmonize our efforts. He told us, “You have headline, the laws of the tribe come first, behind you is the law of the PAMB, let us all agree so that there will be no more problems.” When [Subject 144] took responsibility for the protected area, that is when we were able to connect to one another. (Subject 56)

Today, the PASu even hires qualified indigenous people from area IPOs into their ranks. The current PASu describes how the relationship between indigenous peoples and government agencies can be beneficial to their agency:

[A]ll of our tribal leaders . . . there are even times when they represent our office in other forums. As members of the Council of Elders, they have a deep knowledge of our program operation.

The collaborative governance framework in place in the landscape today, while not perfect, offers many lessons for how conflicts can be managed, cooperation leveraged, and challenges overcome when efforts are made to put IKSP at the center of forest governance.

IKSP are complex systems of practices, rites, rituals, and rules cultivated through interactions with nature that span multiple generations. One of the main challenges confronting researchers and practitioners interested in supporting forestry is to develop community forestry alongside indigenous peoples so that IKSP is prioritized as the main driver of practice within the community. The indigenous peoples we interviewed are very open to learning and using scientific knowledge and tools:

Some of the teachings of our partner NGOs added onto our values. Learning from them raised our knowledge about the multiple benefits that forests yield. For example, about the carbon sequestration that a tree performs. The scientific knowledge that the NGOs taught us was good and we needed to work on that, which is why we gathered a lot from outsiders to raise our knowledge of the environment for the next generation. (Subject 52)

But while they are quite willing to take advice from scientific experts, they also insist on practicing community forestry on their own terms:

Slowly, we are continuing the projects that were started, following the parameters of our culture. We are thankful because in the past our culture almost was left behind. We could barely touch the forest. (Subject 52)

IKSP allow indigenous people to thrive in and sustain their own environments. The IKSP of each indigenous community, while sharing many features with others, is (as we observe) unique, drawing its uniqueness from the specific features of the land and the generations of human, plant, and animal life that have inhabited it (Grenier 1998). Subject 57 describes his people's IKSP in this way:

The life of the Talaandig tribe is intertwined with our forests . . . The forest provides livelihood, giving the Talaadig rattan and fruits. The forest is also a school, where our children become familiar with our fauna. It is a church, where we hold our rituals. And it is a healer, giving us herbal medicines. Among the four components of our tribal culture, the forest is the most sacred.

One uniting feature is that IKSP is always rooted in indigenous peoples' relationship with the environment. Here, we illustrate how commonly held relationships with the flora and fauna housed in the landscape bounds but also distinguishes the indigenous peoples, reflecting the differences in their forests and culture. We constructed a cultural network based on the information on cultural uses of native flora and fauna by four IPOs that was documented through MINMAF's project (Figure 4). In this diagram, the deep green circles represent tribal communities, while light green circles are plants and animals.

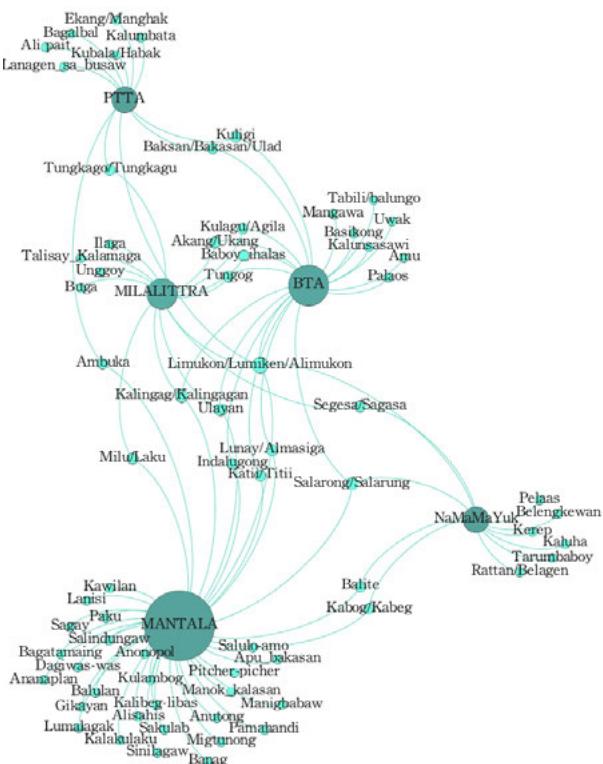


Representation of limukon or white-eared brown dove, *Phapitreron leucotis*

According to some estimates, there are around 429 species in Mount Kalatungan, many of which are important to forest dwelling communities

(Malate 2016). In Figure 4, the central cluster of cultural resources are flora and fauna that all four IPOs commonly ascribe cultural value to. For example, the *limukon/lumiken/alimukon*, or white-eared brown dove, holds a special significance for all of the tribal associations who participated in the study (although their practices and beliefs do differ). The common cultural use demonstrates that there really is a shared value for the forest among these tribal associations. Strong IKSP provides a firm basis for community forestry. Subject 122 provides the following assessment of how different relationships with nature among indigenous communities impacted project implementation:

In [Redacted], their guides were excellent compared with other groups... You can see it in all aspects from their forest restoration efforts, their monitoring and apprehension of illegal loggers.



**FIGURE 4.** Local names of forest flora and fauna identified by respondents as valuable to their communities

These commonalities contribute to cultural practices, norms, and rules which smooth collective action and in turn facilitate forest governance within and across the landscape. In the next sections, we use SNA to better understand forest governance at the landscape level and at the community level.



Representation of bakaka or blue-capped kingfisher, *Actenoides hombroni*

### Using Networks to Leverage Influence within the Landscape

We are happy that it is not only our ancestors who were concerned with caring for nature, but also other groups. This gives us more inspiration, and it strengthens our motivation, it also enriches our traditional approaches to taking care of our natural resources and gives us more strategies on how to manage them.

— Datu Minu

IPO leaders operate within a multilevel governance and therefore need to “manage upward, downward, and outward” (O’Toole et al. 2005, 46). Good leaders are willing and able to manage their relationships to introduce new resources to their communities or to circumvent problematic power structures. Subject 166 offers this insight:

What we need is some kind of landscape governance which gives a broader, ecosystem perspective. That’s what we need to introduce, especially to the young generation. We need to open their eyes . . . What we need right now is understanding, which would really bring or invite people to work together, collaborate, link up, network.

To examine IPO involvement in landscape governance, we use the interview records to build a 191-actor network. The actors in this network are indigenous peoples, local, provincial, and government officials from various sectors including the environmental, agricultural, and social welfare sectors, religious leaders, universities, research institutes, and foundations.

Network position determines the extent to which leaders can spread their ideas, garner support, and sustain a project from inception to implementation

(Balkundi and Kilduff 2006). It is measured using a range of graph theoretic calculations that fall under the category, centrality (Faust 1979). Favorable network positions enable individuals to influence others in the network (Bonacich 1987, Valente et al. 2008). In Table 5, we ranked each IPO leader's position in the landscape in terms of their network centrality measures (degree, power, and betweenness centrality). Since different centrality measures capture different types of network influence, these measures reveal their capacities to play various roles in the landscape.

**TABLE 5.** Network Position of Tribal Chieftains\*

	RANK		
	DEGREE CENTRALITY	POWER CENTRALITY	BETWEENNESS CENTRALITY
BLUPPENTRAS Leader A	51	88	33
CALUDA Leader A	39	79	22
MANTALA Leader A	67	78	82
MANTALA Leader B	28	46	34
MANTALA Leader C	25	45	27
MILALITTRA Leader A	6	10	1
NAMAMAYUK Leader A	16	7	101
NAMAMAYUK Leader B	5	3	3
PTTA Leader A	2	6	2

\* Names are anonymized to protect the identity of these actors. All of these actors are elders within their respective IPOs, which means that they also play a leadership position within their IPO.

Betweenness centrality captures an individual's capacity to serve as an intermediary between nodes and to direct resources in the network (Bodin and Prell 2008). We use it to gauge an individual's capacity to champion a project or cause within their community. Champions are key in "setting and maintaining clear ground rules, building trust, facilitating dialogue, and exploring mutual gains" (Ansell and Gash 2008). In other words, they manage the network. MILALITTRA Leader A has the highest betweenness centrality measure in the entire landscape (closely followed by PTTA Leader A and NAMAMAYUK Leader B). Moreover, BLUPPENTRAS Leader A and CALUDA Leader A are in positions which, if they were linked up with other partners in the landscape, could enable them to better champion community forestry initiatives in the landscape. In MANTALA, Leader B's centrality measures indicate that he can also champion projects within the domain if he takes on an even more prominent leadership role.

Degree centrality reflects an individual's overall level of connectedness. It is a count of an actor's contacts in the network which is then normalized against the network size. Leaders ranked high in terms of degree centrality could be good project sponsors. Sponsors can leverage their social status to raise a project's legitimacy and buy-in (Bryson et al. 2012). It is no surprise that the Leaders of the three IPOs that also lead the Kalatungan Tribal Council have the highest degree centrality. However, one disadvantage of having a high degree centrality is that actors can feel overwhelmed by their many responsibilities. This can take a toll on their leadership capabilities. In this regard, efforts by the Forest Foundation to harmonize activities in the landscape are important:

The Forest Foundation has really been trying to get us to talk and to discuss how we can be more harmonized not only in terms of making sure we are not causing scheduling conflicts, but also to increase synergies. (Subject 190)

Power centrality measures the influence an actor derives by being able to bridge poorly connected nodes to the rest of the network (Bonacich 1987). This means that they are able to bring new actors into the network. Actors with high power centrality can fulfill another important role, which is to empower and advocate for weaker stakeholders (Ansell and Gash 2008). Power centrality allows actors to loop in poorly connected actors into the network. In other words, high power centrality actors are in a position to "generate effective spaces for participation" by indigenous peoples (Adam and Etalyeb 2016). As reported in Table 5, the IPO leaders with the highest power centrality are leaders from PTTA, NAMAMAYUK, and MILALITTRA. One thing that makes these datu willing and able to fulfill this role is that they possess

that level of education and understanding that allow them to effectively represent the voice of the council. (Subject 19)

The fact that these leaders have high betweenness and power centrality indicates that they manage to be integrated within the landscape without losing their independence.

Project managers can also make use of their own centrality measures to assess their level of connectedness, their need to cultivate relationships, and critical resource people in the landscape. For example, even though Subject 183 of XSF is not an indigenous person, she also ranked top 10 in the network in terms of degree centrality and betweenness centrality, which is a testament to Subject 183's reputation as a trustworthy collaborator. This makes Subject 183 an ideal project manager (champion) and also an ideal resource person (sponsor).



Representation of talumbaboy or Mindanao tree shrew, *Urogale everetti*

## Using Networks to Design More Effective Community Forestry Projects

The life of the tribe is dependent on the forest. It is also where we exercise the laws of the tribe. It is like a book that holds our history for our children.

— Datu Jhonny

The six IPOs that we study engage in community forestry to varying extents and have earned reputations as champions of sustainable forestry in the landscape. This is in part due to the effectiveness of these IPOs' forest guards. Officials in the landscape expressed admiration for their ability to detect and prevent illegal activities. Indigenous forest guards are motivated foremost by their communities' enduring relationship with the forest which, as discussed above, they hold as sacred. During the time of this study, forest guards were able to stop a group of individuals from illegally harvesting rattan seedlings (worth an estimated PHP 200,000). The forest guards apprehended and brought them to their elders where they were informed that:

the penalty for that is high, because it is as if you stole things from our home. (Subject 53)

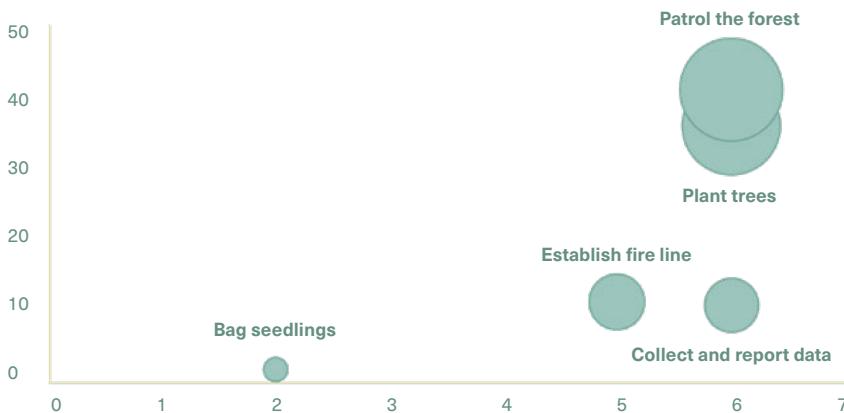
It is this love for the forest that, as described by the PASu, inspires them:

There are times when, in enforcing these environmental laws, their lives are threatened—but they handle it, against all odds. They reason that regardless of who the PASu is, the forest is theirs and they must protect it.



Representation of salarong or Philippine deer, *Rusa marianna*

Forest guards contribute greatly to community forestry. They protect the forest by conducting patrols where they sometimes apprehend intruders and by establishing a fire line to mitigate forest fires; they collect, record, and report data on the forest to the DENR; and they revitalize the forest by providing labor to their seedling nurseries and participating in tree-growing (see Chart 1). This latter set of activities may also provide sustainable livelihoods. The activity which forest guards report as occupying the greatest share of their time is patrolling the forest. When patrolling the forest, guards also routinely collect and report data to the DENR. Some of this data is used to inform reforestation initiatives which span the whole process of cultivating the seedlings, identifying sites for planting, and the planting itself.



**CHART 1.** Forest Guard Main Activities\*

\*The x-axis reports the number of Ancestral Domains engaged in this activity and the y-axis reports the number forest guards that identify this as an ongoing activity.

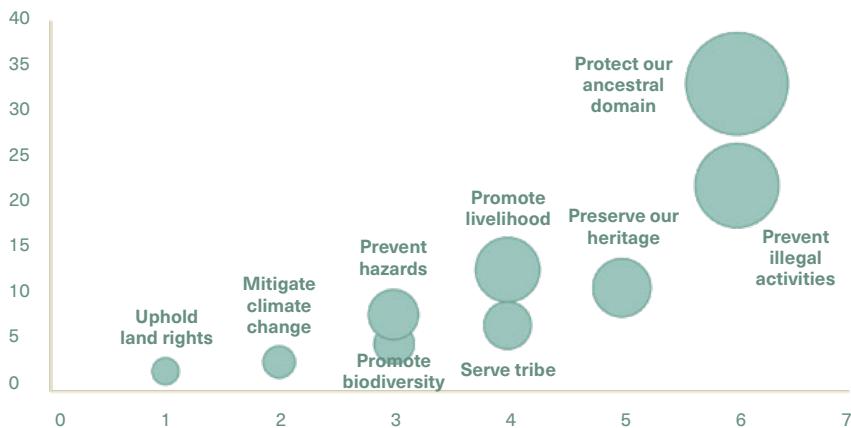
There are many different types of forest guard programs, and some IPOs have more than one. Forest guards are selected by each community's elders. They receive different types of support from their partners (including the City Environmental Resources Offices or CENRO, the Protected Area Management Board or PAMB, and XSF). The level and type of support varies from training (e.g., basic mountaineering courses), to materials, and compensation. If forest guards receive payment, it tends to be too low to cover the opportunity costs of participating in community forestry, which include:

income and time for the education of our children, so that they can cultivate their knowledge of our culture and customs. (Subject 52).

Moreover, the current political climate has made it even more dangerous for environmental defenders like forest guards. Butts et al. (2019) find that 1,558

environmental defenders in 50 countries were killed in the 15-year period from 2002 to 2017. Global Watch argues that indigenous peoples are among the most vulnerable to violent attacks and ranks the Philippines as one of the top five most unsafe places for environmental defenders. At the same time, under-resourced government agencies must be creative in order to provide financial support. One LGU describes their struggle to support community forestry:

The environmental sector is not really prioritized, so every year we need to search for funds appropriation. Previously, the program's budget was taken from the city's Gender and Development program. This year we appropriated funds from the Peace and Order Committee. (Subject 64)



**CHART 2.** Indigenous communities' main community forestry priorities\*

\*The x-axis reports the number of Ancestral Domains engaged in this activity and the y-axis reports the number forest guards that identify this category as a priority.

IPOs identified nine key forest governance priorities, with securing ancestral lands from interlopers considered the main priority of community forestry (Chart 2). These forests are sacred and therefore their rules forbid setting foot within them without first asking permission through rituals or *pamuhat*. Otherwise, the priorities varied widely within and across IPOs. Climate change mitigation, promotion of biodiversity, and hazard prevention were key priorities in their ancestral domains. Joining these intermediary goals are objectives connected to Lumad identity, such as preserving their heritage, serving the community, and upholding indigenous peoples' rights to their land, which involves having and implementing a plan for natural resource conservation within their territories. The diversity of priorities identified by the forest guards reflects the complexity of the landscape, which requires that it be attended to in myriad ways (Kuuluvainen 2009; Pinho et al. 2015). This complexity requires IPOs to make difficult choices that involve complicated tradeoffs.

The priorities of the community may sometimes conflict. One priority that often runs counter to the other priorities is promoting livelihoods. Economic

hardship is one of the main sources of conflict in the community. It can lead community members to violate their indigenous principles and rules. Some of elders attribute these violations to poor cultural education:

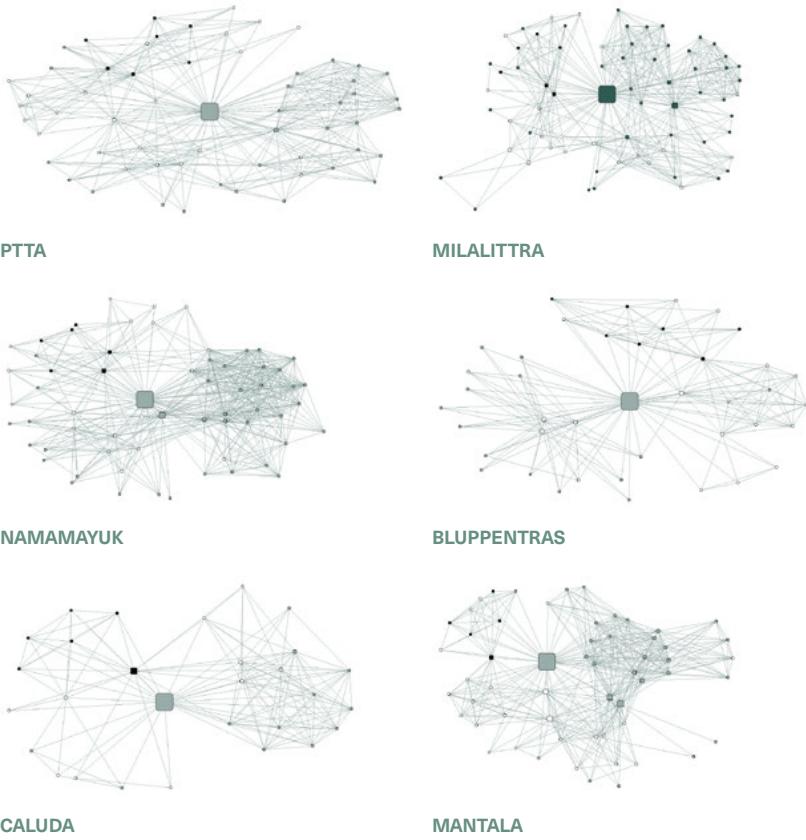
But there are also some who do not sufficiently pass down or socialize their children into the traditional culture and customs. So when they face problems, particularly hospitalization, they place a lien on their land. They see this as the only solution because their understanding of culture is insufficient . . . This is why they fail to recognize that the tribe is here to help them, especially in times of physical illness. This should be the center of our knowledge, to know that your neighbor is there to help you. (Subject 52)

Even outsiders with altruistic aims can, even when they are careful, trigger some internal conflicts over livelihood opportunities. This is why project managers must consider the impact that their interventions will have on the IPO with great care. In doing so, project managers and community partners can use SNA as a tool to improve project implementation (Bodin and Prell 2008; Valente et al. 2015).

Network measures like the clustering coefficient, density, and centralization provide clues about how communities are organized. This information can be useful for the development and design of the projects. We demonstrate how by building networks for each IPO, which include actors working on the frontlines (e.g., forest guards and DENR field officers), IPO elders, NGO partners, and government officials who are explicitly identified by community members as partners (see Figures 5–10).

Table 3 reports the clustering coefficient, density, and centralization measures for each of the IPO networks. These measures have been normalized for the size of the network. The IPO network clustering coefficients ranged from 0.487 to 0.716. Clustering coefficients tell us about a network's tendency to be organized into tightly knit subgroups. The tendency to break down into subgroups is driven by homophily (Bodin and Prell 2011), the predisposition of actors to connect with people who are similar to them (McPherson et al. 2001). Therefore, when clustering coefficients are high, there is a strong potential for goals to become misaligned, giving rise to conflict. Misaligned goals can stand in the way of program implementation, as one of the FFP partners discovered at the outset of their project:

It was when we started the project already, one of the organizations, a new set of officers came and there was a discussion. Their primary concern was with a livelihood program. But our project was never intended to have a livelihood component, so we decided that we could not work together at this time. The conflict stemmed from within the community: they are not united. (Subject 77)



**FIGURES 5–10.** Network representations of community forestry.  
Activities within the community are mediated and steered by IPO leaders, represented as the large circles at the center of each IPO network.

**TABLE 3.** Network Measures and Validating Survey Score

	CLUSTERING COEFFICIENT	NETWORK DENSITY	NETWORK CENTRALIZATION
BLLUPPENTRAS	0.487	0.217	0.825
CALUDA	0.716	0.360	0.626
MANTALA	0.655	0.254	0.559
MILALITTRA	0.548	0.173	0.735
NAMAMAYUK	0.664	0.271	0.741
PTTA	0.547	0.203	0.810

It is therefore useful from the outset of a project to know how community networks are structured so that implementation roadblocks can be anticipated and circumvented (Valente et al. 2015). Based on the clustering coefficients, project managers are advised to invest energy at the beginning of a project to secure buy-ins from the communities with high clustering coefficient (NAMAMAYUK, MANTALA and CALUDA). Once the goals of all stakeholders are aligned, implementation in IPOs with high clustering coefficients will be smooth. Instead, in IPOs with low clustering coefficients, while less energy must be invested in the front end, communication needs to be more constant in the course of project implementation to keep any potential conflicts at bay.

Decision-making in the communities is deliberative. As described by one of the chieftains:

Although the leader has the final say, it is still necessary to consult the people and ask them what their opinions and thoughts are on the issue. For example, when there is a conflict, we call on our committee, the Panahusay, and hold a meeting where I ask them their opinion on it. So when we hold discussions on our tribe's history, we still involve the Panahusay and our Panagubod [Historian] who recounts what happened in the past so that we can avoid conflict by basing our decision on that as well. We used this process when discussing our current project with Forest Foundation. (Subject 58)

Deliberative processes are facilitated by network density. Density is measured by taking the proportion of relationships that are present in all relationships that could potentially be formed. High density indicates that a network has more trusting relationships. Trust raises the capacity for effective deliberation, negotiation, resource mobilization, and collective action (Hileman and Lubell 2018; Bodin and Prell 2011; Henry and Volland 2014). Trust lowers transaction costs (Emerson et al. 2012) and facilitates the development of rules, compliance with those rules and norms, and promotes knowledge sharing and learning (Ansell and Gash 2008). All of the networks have low density (density ranged from 0.173 to 360), due in part to the recent entrance of many new actors (e.g., the Philippine Coffee Alliance) who have yet to develop tight-knit relationships with the communities. Project managers could also benefit from accounting for such dynamics when considering whether a project is worthwhile.



Representation of ulayan or Philippine oak tree, *Lithocarpus caudatifolius*

Centralization provides a measure of leadership. It represents the extent to which a single actor dominates a network's relationship structures (Sandström and Carlsson 2008). When centralization is high, activities in the network are mainly organized by one or a few central actors. High centralization is a measure of strong leadership within the IPO. Leadership can be a decisive factor for jointly addressing a shared problem (Ostrom 2009; Huxham and Vangen 2005), like deforestation. It is necessary for establishing and enforcing agreed upon rules, especially when groups compete for access to resources. Strong leadership can also help guide deliberation, settle conflicts, and champion endeavors (Agranoff 2006; Bryson et al. 2006; Carlson 2007). In line with the literature, we observe that IPOs are advantaged in cross-cultural collaborations when their leaders are both grounded in their culture and possessing an understanding of Western science (Martello 2008; Mato 2000). For example:

[redacted] has a leader who is highly educated but still very grounded in his cultural values. He makes it easier for his community to understand what we're trying to do and also for us to understand why a tribe is declining to participate. (Subject 19).

Indeed, the effectiveness of forest governance in the landscape is widely attributed to IPO leaders:

First, it is the tenacity of the leaders. Even I would have surrendered many times, but not them. Second, these Datus have spotless reputations and credibility. They are very selfless; anyone can clearly see it. (Subject 11)

Centralization ranges from 0.559 to 0.825. CALUDA has a low centralization score because the community is a subsidiary of PTTA and so the community recognizes both its own leader and PTTA's. In the case of CALUDA, this does not seem to cause friction because the chain of command is clear (all members of CALUDA named their chieftain, and not the chieftain of PTTA, as the individual that should be consulted over community forestry). Instead, the low centralization score for MANTALA, combined with the survey results, indicates some potential problems which can affect project implementation. When asked who in MANTALA should to be consulted regarding community forestry, forest guards named three different individuals. This lack of clear leadership can cause frictions, as one of the interviewed forest guards describes:

It makes it difficult to accept projects intended to help us because people will automatically disagree even without trying to understand what the project is about. Just like when [redacted] approached us with its project, the leaders were divided and some disagreed because it did not have a livelihood component. It was a challenge to convince them. Afterwards, everyone was thankful for what [redacted] did."

Project leaders could use centralization scores to consider how to approach IPO leadership and to assess the amount of support that their champions on the ground need to expend on getting the rest of the community to buy in.

To summarize, network measures like the clustering coefficient can indicate the intensity of early involvement required for the successful design and implementation of a project, while density indicates the level of trust within a network. Finally, centralization provides some clues on the need to cultivate champions within the IPO. Knowledge gleaned from these analyses can be enriched by insights offered by applying SNA to the landscape-wide network.



Representation of ekang or giant scops owl, *Otus gurneyi*

## A Landscape Full of Opportunity?

The nearer that indigenous peoples are to the forest, the more relationships they have to it.  
— Professor Toledo Bruno

During our time in the landscape, the leaders identified further opportunities for strengthening community forestry in the Kalatungan Mountain Range. All three of these are tied to IKSP.

First, indigenous peoples would like to continue to provide their children with an education that coheres with their own IKSP. When the mother culture of the indigenous community becomes too distant from its strong root in the environment, the consequences for the forest are dire (Malate 2016). The reverse is also true. This is why passing IKSP down to indigenous youth is a priority for these IPOs. One leader told us:

And now the forest is shrinking, this spells the end for our tribe because we are dependent on the forest. This is why I am grateful that now we have teachers who can teach our children here, within our ancestral lands.  
(Subject 55)

And when it comes to their education, the IPOs are not willing to compromise on IKSP:

We placed a *sala-on* (penalty) on the school's principal, who was an outsider. The principal looked down on our culture. Word reached us that the principal insisted that the school was for study and refused to hold a ritual. We informed the division and the principal was sent away from [Redacted] Elementary and they paid their obligation (*sala*). (Subject 63)

The second way to improve community forestry is to uphold indigenous peoples' rights to their ancestral land. Modern life can threaten indigenous peoples' relationship with nature, a disruption which is intensified by land-grabbing.

The National Commission on Indigenous Peoples (NCIP) may seem like the obvious champion of indigenous peoples when it comes to upholding their land rights. However, the relationship between the NCIP and indigenous peoples in this landscape is fraught. Subject 57 (the head claimant of an IPO) articulates:

When the NCIP was formed, we believed that they were our advocates. As it turns out, and we absolutely did not expect this, it is as if they are our adversaries. They have initiated processes which would allow others to seek permission to ruin our forests.

The NCIP was formed and given the mandate of implementing 1997's Indigenous Peoples' Rights Act (IPRA). IPRA supports the overarching framework offered by community forestry (Pulhin and Inoue 2008) by recognizing that indigenous peoples' right to their ancestral lands is universal, indivisible, interdependent, and interrelated (Schippers 2010; Pulhin and Inoue 2008). More than two decades later, many indigenous peoples still struggle to secure their ancestral domains through IPRA, while in a few instances land titles were mistakenly granted to false and opportunistic claimants. The implementation gap has been attributed to a number of factors including (1) financial and technical barriers imposed on applicant indigenous communities; (2) inadequate government resources allocated to this process, (3) conflicts between IPOs and local government, (4) disagreements within IP communities about who the head claimant should be, and above all, (5) resistance, corruption, and incompetence at the NCIP (Drbohlav and Hejkrilk 2017; Garrity 2001; Molintas 2004; Carino, 2012; Capistrano 2010; Minter 2014; Ting et al. 2008). In consequence, IPOs have cultivated champions elsewhere, including local government.

Third, leaders expressed a wish for greater representation in local government. Community forestry is also shaped by local government: its capacities, its interests, and its stability. One project partner gave the following example:

Although the barangay is run by a barangay captain, in terms of population the majority are Talaandig who report to their community elders, so when there are government edicts that conflict with the culture of the Talaandig, who will be followed? (Subject 166).

When supportive, the LGU can be instrumental in promoting community forestry. However, it can also be an obstacle. When local government views IPOs as challengers to their authority rather than partners in governance, the results can be detrimental to both ecosystems and to governance writ large (Capistrano 2010). For example, one of our IPOs which spans four local governments and with its members living in one jurisdiction expresses positive sentiments about their local government:

It is my responsibility to represent the tribe's interests, especially the forest, at the (local government) by ensuring that we get a say regarding whether organizations or projects will be allowed in our ancestral domain. (Subject 88)

Another member of the same IPO living a neighboring jurisdiction claims that:

Our local government was not supporting the tribe's ideas and activities . . . This is one of our main struggles . . . For now, the barangay and the tribe are not united and this discourages tribespeople from participating in different initiatives." (Subject 135)

This underlines the need for an effective Indigenous Peoples Mandatory Representation (IPMR) in local government. Local governments at all levels are required by IPRA to have an IPMR, however this role and processes for the selection of IPMRs remains poorly understood. Empowering IPMRs represents just one of many opportunities for more effective community forestry in the landscape which go hand in hand with strengthening their IKSP.

## Conclusion

In Kalatungan, the future of the forest and of indigenous peoples are inseparable. Across the globe, the future of the indigenous peoples and the future of humanity are inseparable. According to the IPCC, we have little more than a decade to reverse our course toward a hothouse earth (Steffen et al. 2018; IPCC 2018). Forests are key to taking us onto an alternative path. This is why it is important that the design of forest conservation and regeneration projects takes into account how these projects are shaped by and shape the experience of forest dwelling communities.

In this chapter, we described the current governance framework within the Kalatungan Mountain Range and describe how this framework is held up by relationship dynamics that emerge from efforts by the indigenous peoples in the landscape to protect their forests.

The section “Challenges and Opportunities for Indigenous Peoples’ Community Forestry in and Across the Kalatungan Mountain Range” uses network analysis to describe two types of relationship structures in the landscape. First, it shows how IPOs and other organizations are connected to one another through their participation in landscape governance. This analysis reveals that not only are IPOs connected to one another through their advocacy, they are also connected to many similar organizations, like Forest Foundation partners, XSF and MINMAF, as well as government agencies (see Figure 3). For indigenous peoples practicing community forestry, the network analysis reveals additional opportunities to form partnerships. For example, the SNA indicates that XSF is a key player in the landscape. This suggests that XSF can fulfill the role of a boundary organization that facilitates the transfer of technology and scientific knowledge to IPOs in the landscape. Less centrally located organizations like PCA could benefit from partnering with XSF. However, it is also important not to overburden indigenous communities. Participating in projects takes them away from their farms and means of livelihood. The network analysis can also reveal if too many projects are concentrated in one area of the landscape and whether there is a redundancy among projects and initiatives. Not only does SNA mapping provide important indications of who the most active network players are, it also indicates who the least connected actors are. For instance, the network analysis also suggests that local governments lie at the periphery of these networks. Bringing them more closely into the fold of the network may strengthen relationships between local government and IPOs, which in turn may help raise the sustainability of community forestry in the landscape. The second analysis illustrates how common cultural practices bind IPOs across the landscape together (see Figure 4). At the same time, it also shows—through unique IPO-to-nature relationships—the richness of biodiversity across the landscape.

The section “Using Networks to Leverage Influence within the Landscape” reveals intervention opportunities within the forest landscape by showing how different actors are positioned in the network. Projects benefit from the sponsorship of actors with high degree centrality. High degree centrality actors tend to have a strong and positive reputation in a landscape, and many people are likely to get on board with a project once it receives these individuals’ stamp of approval. When a project leader needs to access resources (e.g., knowledge or technological resources), it may be beneficial to work with individuals with high betweenness centrality because these actors are the networks’ “points of contact.” Finally, if project managers are interested in working with hard-to-reach or hard-to-serve populations, it may be good to work with actors who have high power centrality and can use this position to bridge to those target

groups. This analysis can help program managers understand who may be better able to advocate for or sponsor their project within IPO communities and across the landscape. In contrast, the analyses performed in the section “Using Networks to Design More Effective Community Forestry Projects” provide a profile of the structural characteristics of each community, thereby revealing hidden undercurrents which may facilitate or block a project’s success.

In the previous section, we make three recommendations to improve forest governance in the landscape (even if they don’t entail conventional forest conservation or rehabilitation) which are critical for preserving biodiversity in Mount Kalatungan and on all forests that overlay ancestral lands: (1) that activities that strengthen IKSP—particularly intergenerational learning on IKSP—should be supported; (2) IPO efforts to secure their Certificate of Ancestral Domain Title (CADT) should be championed; and (3) indigenous peoples should have stronger representation at all levels of government, particularly local government.

In sum, we illustrate how network positions can be used to understand actors’ positions (and influence) within the network, as well as crucial intergroup dynamics which may help or hinder project implementation. Network analysis can, for example, indicate if there is fragmentation or conflict within a community. Understanding whether there are tensions or fault lines helps project managers avoid triggering conflicts and/or helps them avoid disagreements with community members which may derail their project. We hope that this demonstration may be useful for project managers interested in implementing community forestry projects on indigenous lands.

It is also important to acknowledge the limitation of SNA. While SNA can capture relational dynamics, when applied as a tool for improving project implementation, network analysis cannot explain what causes these observed dynamics. Indeed, the local governance institutions and networks observed in this chapter are embedded within complex socio-ecological systems which require a wide array of approaches to fully encapsulate them. In other words, insights from SNA must be triangulated against and complemented with other methodological tools in order to fully unpack the complexities inherent to landscapes like the Kalatungan Mountain Range.

This chapter aims to offer insights into how SNA can be used to design projects as well as to evaluate their merits. We argue that SNA can be used to find ideal communities to target for intervention, to identify potential problematic relational patterns which can be mediated ahead of time, and to find champions and targets. SNA is just one of many tools that can be used to deepen project managers’ knowledge of the socio-ecological systems that they aim to sustain. Careful attention to relational dynamics not only raises the potential for successful project management; it can also ensure that the design, implementation, and evaluation of projects is more inclusive and ethical.

## Notes

1. The Indigenous Peoples Rights Act (IPRA), or Republic Act No. 8371 of the Philippines, defines indigenous people as: “homogenous societies identified by self-ascription and ascription by others, who have continuously lived as a community in community-bounded and defined territory, sharing common bonds of language, customs, traditions and other distinctive cultural traits, and who have, through resistance to political, social and cultural inroads of colonization, become historically differentiated from the majority of Filipinos.”
2. These documents include funding applications and technical and financial reports on project progress.
3. This is the first project for MINMAF, and the second for XSF. XSF’s first Forest Foundation project was Payment for Ecosystem Services (PES), which was pilot-tested in 2014 together with the Miarayon-Lapok-Lirongan-Tinaytayan Talaandig Tribal Association (MILALITTRA) through the support of the Mindanao Development Authority (MinDA) and Cagayan de Oro River Basin Management Council (CDORBMC), among others.
4. Betweenness centrality measures how often each node lies in the path of two other nodes, relative to all other nodes in the network.
5. These networks were validated by consultation (interviews and focus groups) with partner organizations and other experts working in the region.
6. The authors would like to note that they also attempted to contact the NCIP, PENRO, and various LGUs multiple times to request interviews. They did not receive any acknowledgement of their inquiries.
7. The moratorium was established through Executive Order no. 23 in 2011: “Declaring a Moratorium on the Cutting and Harvesting of Timber in the Natural and Residual Forests and Creating the Anti-Illegal Logging Task Force.”
8. Interestingly, Kuizon (1963) points out that beliefs about this bird spans peoples worldwide, including communities in Ireland, Russia, and Spain. This speaks to the ecological connections which link humankind.
9. The authors describe environmental defenders as “people engaged in protecting land, forests, water, and other natural resources.”
10. In a few interviews, it was revealed that some Certificate of Ancestral Domain Title (CADT) applications have remained unresolved for decades.

## References

- Abate, R. S. and E. A Kronk. 2013. Commonality Among Unique Indigenous Communities: An Introduction to Climate Change and Its Impacts on Indigenous Peoples. In *Climate Change and Indigenous Peoples: The Search for Legal Remedies*, edited by R. S. Abate. Cheltenham, UK: Edward Elgar Publishing.
- Amoroso, V.B. 2012. Natural Resource: Inventory and Conservation of Endangered, Endemic and Economically Important Plants in Selected Forests of Mindanao. Northern Mindanao Consortium for Agricultural Resources Research and Development (NOMCARRD). [http://www.nomcarrd.org/index.php?option=com\\_content&view=article&id=49:natural-resources&catid=47:cy-2003&Itemid=57](http://www.nomcarrd.org/index.php?option=com_content&view=article&id=49:natural-resources&catid=47:cy-2003&Itemid=57).
- Ansell, C. and A. Gash. 2008. Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory* 18 (4): 543–571.
- Armitage, D. 2005. Adaptive Capacity and Community-Based Natural Resource Management. *Environmental Management* 35 (6): 703–715.
- Asner, G. P., P. G. Brodrick, C. B. Anderson, N. Vaughn, D. E. Knapp, and R. E. Martin. 2016. Progressive Forest Canopy Water Loss during the 2012–2015 California Drought.

- Proceedings of the National Academy of Sciences* 113 (2): E249–255. <https://doi.org/10.1073/pnas.1523397113>.
- Balkundi, P. and Kilduff, M. 2006. The Ties that Lead: A Social Network Approach to Leadership. *The Leadership Quarterly* 17 (4): 419–439.
- Bird Life International. 2011. Important Bird Areas Factsheet: Mount Kalatungan Range Natural Park. <http://www.birdlife.org/datazone/sitefactsheet.php?id=9795>.
- Bodin, Ö. and C. Prell, eds. 2011. *Social Networks and Natural Resource Management: Uncovering the Social Fabric of Environmental Governance*. Cambridge, UK: Cambridge University Press.
- Bodin, Ö., A. Sandström, and B. Crona. 2017. “Collaborative Networks for Effective Ecosystem-Based Management: A Set of Working Hypotheses.” *Policy Studies Journal* 45 (2): 289–314.
- Bodin, Ö. and B. Crona. 2009. The Role of Social Networks in Natural Resource Governance: What Relational Patterns Make a Difference? *Global Environmental Change* 19 (3): 366–374.
- Bonacich, P. 1987. Power and Centrality: A Family of Measures. *American Journal of Sociology* 92 (5): 1170–1182.
- Bonan, G. B. 2008. Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests. *Science* 320 (5882): 1444–1449. <https://doi.org/10.1126/science.1155121>.
- Borgatti, S. P., A. Mehra, D. J. Brass, and G. Labianca. 2009. Network Analysis in the Social Sciences. *Science* 323 (5916): 892–895. <https://doi.org/10.1126/science.1165821>.
- Braun, S. 2020. 5 Deadly Countries for Environmental Defenders. Deutsche Welle, 28 July. <https://www.dw.com/en/5-deadly-countries-for-environmental-defenders/a-54298499>.
- Bryson, J. M., B. C. Crosby, and M. M. Stone. 2006. The Design and Implementation of Cross-Sector Collaborations: Propositions from the Literature. *Public Administration Review* 66: 44–55.
- Butt, N., F. Lambrick, M. Menton, and A. Renwick. 2019. The Supply Chain of Violence. *Nature Sustainability* 2: 742–747. <https://doi.org/10.1038/s41893-019-0349-4>.
- Canadell, J. G. and M. R. Raupach. 2008. Managing Forests for Climate Change Mitigation. *Science* 320 (5882): 1456–1457.
- Capistrano, R. C. G. 2010. Reclaiming the Ancestral Waters of Indigenous Peoples in the Philippines: The Tagbanua Experience with Fishing Rights and Indigenous Rights. *Marine Policy* 34 (3): 453–460.
- de Vera, D. and J. Guina. 2008. The Igmale’ngén sacred forests of Portulin—Part of the Ancestral Domain Conserved by the Talaandig Peoples of Mindanao, Philippines. International Union for Conservation of Nature (IUCN). [https://www.iucn.org/sites/dev/files/import/downloads/portulin\\_philippines\\_report\\_icca\\_grassroots\\_discussions.pdf](https://www.iucn.org/sites/dev/files/import/downloads/portulin_philippines_report_icca_grassroots_discussions.pdf).
- Emerson, K., T. Nabatchi, and S. Balogh. 2012. An Integrative Framework for Collaborative Governance. *Journal of Public Administration Research and Theory* 22 (1): 1–29.
- Erni, C., ed. 2015. *Shifting Cultivation, Livelihood and Food Security: New and Old Challenges for Indigenous Peoples in Asia*, 3. Chiang Mai: Food and Agriculture Organisation of the United Nations (FAO), Asia Indigenous Peoples' Pact (AIPP), and International Work Group for Indigenous Affairs (IWGIA).
- Granovetter, M. 1985. Economic Action and Social Structure: The Problem of Embeddedness. *The American Journal of Sociology* 91 (3): 481–510.
- Green, D., and G. Raygorodetsky. 2010. Indigenous Knowledge of a Changing Climate. *Climatic Change* 100 (2): 239.
- Grenier, L. 1998. *Working with Indigenous Knowledge: A Guide for Researchers*. Ottawa: International Development Research Centre. Henry, A. D. and B. Volland. 2014. Networks and the Challenge of Sustainable Development. *Annual Review of Environment and Resources* 39: 583–610.
- Hileman, J. and M. Lubell. 2018. The Network Structure of Multilevel Water Resources Governance in Central America. *Ecology and Society* 23 (2): 48. <https://doi.org/10.5751/ES-10282-230248>.

- IPCC (The Intergovernmental Panel on Climate Change). 2018. Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty. <https://www.ipcc.ch/sr15/>.
- Irvin, R. A. and J. Stansbury. 2004. Citizen Participation in Decision Making: Is It Worth the Effort? *Public Administration Review* 64 (1): 55–65.
- Kellert, S. R., J. N. Mehta, S. A. Ebbin, and L. L. Lichtenfeld. 2000. Community Natural Resource Management: Promise, Rhetoric, and Reality. *Society & Natural Resources* 13 (8): 705–715.
- Knocke, D. and S. Yang. 2008. *Social Network Analysis*, 2nd ed. Thousand Oaks, CA: Sage.
- Kuizon, J. G. 1963. The Social Significance of the Agusan Manobo Myths. *Philippine Sociological Review* 11 (1/2): 130–134.
- Kuuluvainen, T. (2009). Forest Management and Biodiversity Conservation Based on Natural Ecosystem Dynamics in Northern Europe: The Complexity Challenge. *AMBIO: A Journal of the Human Environment* 38 (6): 309–315.
- Lasco, R. D., R. S. Evangelista, and F. B. Pulhin. 2010. Potential of Community-Based Forest Management to Mitigate Climate Change in the Philippines. *Small-Scale Forestry* 9 (4): 429–443.
- Lasco, R. D. and J. M. Pulhin. 2006. Environmental Impacts of Community-Based Forest Management in the Philippines. *International Journal of Environment and Sustainable Development* 5 (1): 46–56.
- Lasco, R. D. and F. B. Pulhin. 2000. Forest Land Use Change in the Philippines and Climate Change Mitigation. *Mitigation and Adaptation Strategies for Global Change* 5 (1): 81–97.
- Leach, M., R. Mearns, and I. Scoones. 1999. Environmental Entitlements: Dynamics and Institutions in Community-Based Natural Resource Management. *World Development* 27 (2): 225–247.
- Li, T. M. 2002. Engaging Simplifications: Community-Based Resource Management, Market Processes and State Agendas in Upland Southeast Asia. *World Development* 30 (2): 265–283.
- Malate, R. P. 2016. The Role of the Dayak People of Indonesia and the Philippines' Menuvū Tribe of the Keretungan Mountain in Ecological Conservation: The Natural and Indispensable Partners. *Jurnal Kajian Wilayah* 5 (2): 217–231.
- Martello, M. L. 2008. Arctic Indigenous Peoples as Representations and Representatives of Climate Change. *Social Studies of Science* 38 (3): 351–376.
- Mato, D. 2000. Transnational Networking and the Social Production of Representations of Identities by Indigenous Peoples' Organizations of Latin America. *International Sociology* 15 (2): 343–360.
- McPherson, M., L. Smith-Lovin, and J. M. Cook. 2001. Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology* 27 (1): 415–444.
- Nakashima, D. and Roue, M. 2002. Indigenous Knowledge, Peoples and Sustainable Practice. In *Encyclopedia of Global Environmental Change* vol. 5, edited by Ted Munn, 314–324. Chichester, UK: John Wiley & Sons.
- Norton-Smith, K., K. Lynn, K. Chief, K. Cozzetto, J. Donatuto, M. H. Redsteer and K. P. Whyte. 2016. Climate Change and Indigenous Peoples: A Synthesis of Current Impacts and Experiences. US Department of Agriculture Forest Service, Pacific Northwest Research Station, 136.
- Ostrom, E. 2009. A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science* 325 (5939): 419–422.
- O'Toole Jr., L. J., K. J. Meier, and S. Nicholson-Crotty. 2005. Managing Upward, Downward and Outward: Networks, Hierarchical Relationships and Performance. *Public Management Review* 7 (1): 45–68.
- Peña, G. D. D., Q. W. Areola, C. C. Tanael, F. C. Paler, D. M. Cortez, A. Librero, and J. R. M. Flores. 2017. Adaptive Measures to Climate Change among the Higaonon Communities

- in Naawan and Initao, Misamis Oriental, Mindanao, Philippines. *American Journal of Social Sciences, Arts and Literature* 4 (1): 1–7.
- Pinho, P. F., J. A. Marengo, and M. S. Smith. 2015. Complex Socio-Ecological Dynamics Driven by Extreme Events in the Amazon. *Regional Environmental Change* 15 (4): 643–655.
- Prell, C., K. Hubacek, and M. Reed. 2009. Stakeholder Analysis and Social Network Analysis in Natural Resource Management. *Society and Natural Resources* 22 (6): 501–518.
- Provan, K.G. and H. B. Milward. 2001. Do Networks Really Work? A Framework for Evaluating Public-sector Organizational Networks. *Public Administration Review* 61 (2): 414–423.
- Pulhin, J. M. and Inoue, M. 2008. Dynamics of Devolution Process in the Management of the Philippine Forests. *International Journal of Social Forestry* 1 (1): 1–26.
- Pulhin, J. M., M. Inoue, and T. Enters. 2007. Three Decades of Community-Based Forest Management in the Philippines: Emerging Lessons for Sustainable and Equitable Forest Management. *International Forestry Review* 9 (4): 865–883.
- Reed, M. S. 2008. Stakeholder Participation for Environmental Management: A Literature Review. *Biological conservation* 141 (10): 2417–2431.
- Ribot, J. C. 2009. Authority over Forests: Empowerment and Subordination in Senegal's Democratic Decentralization. *Development and Change* 40 (1): 105–129.
- Robyn, L. 2002. Indigenous Knowledge and Technology: Creating Environmental Justice in the Twenty-First Century. *American Indian Quarterly* 26 (2): 198–220.
- Steffen, W., J. Rockström, K. Richardson, T. M. Lenton, C. Folke, D. Liverman, C. P. Summerhayes, A. D. Barnosky, S. E. Cornell, M. Crucifix, J. F. Donges, I. Fetzer, S. J. Lade, M. Scheffer, R. Winkelmann, and H. J. Schellnhuber. 2018. Trajectories of the Earth System in the Anthropocene. *Proceedings of the National Academy of Sciences* 115 (33): 8252–8259. <https://www.pnas.org/content/115/33/8252>.
- Sandström, A. and L. Carlsson. 2008. The Performance of Policy Networks: The Relation between Network Structure and Network Performance. *Policy Studies Journal* 36 (4): 497–524.
- Shackleton, S., B. Campbell, E. Wollenberg, and D. Edmunds. 2002. Devolution and Community-Based Natural Resource Management: Creating Space for Local People to Participate and Benefit. *Natural Resource Perspectives* 76 (1): 1–6.
- Sobrevila, C. 2008. *The Role of Indigenous Peoples in Biodiversity Conservation*. Washington, D.C.: World Bank.
- Ting Jr., M. T. G., A. C. Bagsic, M. M. Eguilos, R. Jaen, M. L. P. Respicio, and C. R. T. Tan. 2008. Modernity vs. Culture: Protecting the Indigenous Peoples of the Philippines. *European Journal of Economic and Political Studies* 1: 91–114.
- Ulibarri, N. and T. Scott. 2017. Linking Network Structure to Collaborative Governance. *Journal of Public Administration Research and Theory*, 27 (1): 163–181.
- Valente, T. W., L. A. Palinkas, S. Czaja, K. H. Chu, and C. H. Brown. 2015. Social Network Analysis for Program Implementation. *PLoS ONE* 10 (6): 1–18. <https://doi.org/10.1371/journal.pone.0131712>.
- Valente, T. W., K. Coronges, C. Lakon, and E. Costenbader. 2008. How Correlated Are Network Centrality Measures? *Connections (Tor)* 28 (1): 16–26.



# PROTECTING THE ENVIRONMENT: An Exploration of the Roles, Motivations, and Lived Experiences of Forest Guards in the Philippines

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## Abstract

Despite the existence of forest guards (e.g., forest rangers, *bantay gubat*) as “field-level implementers” of environmental policies all over the country, and despite the violence they face, little scholarship has been done to document their motivations, roles, and lived experiences. This chapter seeks to fill this void by presenting findings from a multi-sited qualitative study, in which 12 focus group discussions were conducted among forest guards in Luzon and Northern Mindanao. Common themes that emerged include the sense of financial, physical, and legal vulnerability, lack of recognition, the role of politics in their work, and a range of motivations including a strong sense of identity and a conception of the mountains as “home.” Overall, both the study’s descriptive findings and analytical insights can inform policies and programs that involve forest guards, support arguments for greater support and recognition for their work, and serve as baseline data for further research to understand the many other contexts and environments forest guards find themselves in.

## Introduction

“For agenda setting and policy design, public policies that involve or affect local communities are often negotiated in the field rather than the office, yet development literature has surprisingly neglected the characteristics, social conditions, perceptions and attitudes of field-level implementers of policy.” These words, penned by Sudha Vasan (2002, 4125) as a preamble to her study “Ethnography of the Forest Guard” in India, articulate the premise of this chapter. We speak of forest conservation as an urgent imperative, but how much do we really know about the people who implement it in its various geographic and socioeconomic contexts? Who are they, what do they themselves feel about their work, and what are their own views about forest protection?

Despite the self-evident significance of these questions, little has been done in the Philippines to answer them. Indeed, as a review of local literature shows (see Lasco, Mendoza, and Aldama, forthcoming), much of the published work in the country has concentrated on tensions between indigenous peoples, conservation, and development (e.g., Novellino and Dressler 2009, Perez 2018, Novellino 2003, and Minter et al. 2014), indigenous conservation practices and ontologies (e.g., Canoy and Suminguit 2001, Dressler 2009, and Camacho et al. 2012), as well as the “community” and its knowledge, attitudes, practices, and involvement in both conservation and exploitation (e.g., Acebedo 1999, Lantican 2001, and Pulhin and Dressler 2009). Forest guards figure in these accounts as part of the narrative (for instance, Perez 2018 in her account of Mount Pulag National Park and Cairns 1997 in his case study of Mount Kitanglad), but their own narratives are rarely foregrounded. Intriguingly, van der Ploeg (2011, 209) has claimed that the “multi-stakeholder co-management” paradigm espoused by Department of Environment and Natural Resources (DENR)—including the formation of local protection groups such as those of forest guards—“clearly reflects the idea that participation minimises forest crimes . . . But the call for broad societal involvement in forest protection currently serves as an apology for the inability of the DENR to enforce forestry regulations.”

Such a paucity of scholarship does not do justice to a group—however heterogenous in its composition—that has been seen as a cornerstone in forest governance in the country for over a century. At the twilight of Spanish colonialism, assistants, senior guards, and minor guards belonging to the Inspección General de Montes were tasked to arrest the destruction of forests—even as their own interests often conflicted with those of the colonial state and as the state itself increasingly took on a commercial outlook as far as forest use is concerned (Bankoff 2004). Such contradictions would continue during the American and postcolonial periods, when forest rangers under the Bureau of Forestry, and later, the Bureau of Forest Development (BFD), would serve as environmental frontliners tasked to protect public forest lands, but likewise facilitated (or at least tolerated) the state-sanctioned exploitation of

forests (Pulhin and Dizon 2003; Van den Top 2003). A major shift in policy and paradigm after the Marcos dictatorship—one that prioritized conservation over corporate logging, privileged participatory approaches—led to a renewed importance of forest rangers within the DENR; and the rise of volunteer guards, especially after the official enshrinement of Community-Based Forest Management (CBFM) as state policy in 1995 (Lasco and Pulhin 2006). Even so, to reiterate the point above, forest guards have remained marginal—if not entirely invisible—in these policy analyses.

Further adding to the significance of forest guards is that they are, at least in the case of the volunteer guards, also part of mountain communities and are therefore part of indigenous land use systems, acculturated to traditional (and modern) ways of forest use (McDermott 2000; Van den Top 2003). Thus, they navigate their *positionnalities* both as “agents of conservation” (Perez 2018) and as community members.

This chapter aims to address this gap by presenting findings and insights from a multi-sited qualitative study that foregrounds forest guards and their roles, challenges, and lived experiences. Following Vasan (2002), I define forest guards as field-level implementers of policy that are engaged by government or non-government organizations either on an official or unofficial basis, regardless of employment status (e.g., voluntary, contractual, regular employment). Working with a small research team, I conducted 12 focus group discussions (FGDs) with forest guards (typically referred to as forest rangers, forest guards, or *bantay gubat*) in Luzon and Northern Mindanao to document their demographic profiles and backgrounds, elicit narratives of their everyday lives and experiences, and explore their own notions of forest protection. In addition, we observed some relevant events involving forest guards and conducted over a dozen key informant interviews (KIIs) involving people they interact with.

Although primarily a descriptive account, this chapter also draws emergent themes from the guards’ accounts to engage with the existing literature, recent developments involving guards in the Philippines, and the current policy environment in the country. Given what is at stake in forest conservation, learning more *about* its implementers, as well as *from* them, can help refine policies both toward the forest rangers themselves and forest governance as a whole. Moreover, they can also serve to evaluate the lived realities of programs that have been implemented with and through the rangers—from the National Greening Program to policies concerning logging and mining—but not necessarily with their input. Amid a backdrop of deadly violence against environmental defenders, including forest guards, in the Philippines (Global Witness 2019), this project also contributes to the urgent task of documenting the risks forest protectors face, and reflecting on what can be done to protect them.

## Methodology

This qualitative study draws inspiration from grounded theory (Charmaz and Belgrave 2012) to allow for an inductive, open-ended exploration of the forest guards' lifeworlds. A grounded theory approach involves not having any prior framework applied, and is particularly useful for topics with a relative lack of similar previous investigations. In this chapter, no coding framework was imposed apart from an overall focus on the experiences of the forest guards themselves, as well as their views about their work and about forest conservation in general.



Representation of Mt. Makiling

The study sites include two protected areas in Bukidnon, various locations in the Sierra Madre range, and Mount Makiling. The selection of these sites was guided by the desire to explore a variety of geographic and sociopolitical contexts. While some are officially protected areas, others are contested by different actors, including various government agencies, the private sector, and communities both indigenous and non-indigenous. Regardless of these differences, what the sites have in common is that they are critical watershed areas that are rich in biodiversity but have been subjected to exploitative activities like logging, mirroring the above-mentioned history of forest (ab)use. With the possible exception of Mount Makiling, communities in these sites have been historically characterized by rural poverty (Cairns 1997; Van Der Ploeg 2011).

The two sites where most of the interviews were conducted deserve more description to further illustrate the context of the study. With a total land area of 1.4 million hectares spanning 10 provinces, the Sierra Madre range holds immense value as the home of the largest intact primary forest in the country, as well as high faunal and floral diversity, serving as Luzon's great watershed and natural barrier for typhoons (van der Ploeg, Bernardo, and Masipiquena 2003). Meanwhile, the Kitanglad Range, where a plurality of the interviews were conducted, is similarly a biodiversity haven with an astounding 63 mammalian and 168 avian species, 62 of which are endemic (Opiso et al. 2014). Within this area, in seven municipalities and one city in Bukidnon province, 47,270 ha constitute the Mount Kitanglad Range National Park (MKRNP), but like the Sierra Madre, its cultural, economic, environmental, and hydrological significance goes beyond this area (*ibid.*).

Twelve focus group discussions were conducted in the research sites (see Table 1), mainly in Filipino but with some parts in Cebuano, complemented by participant-observation sessions in Bukidnon and the Sierra Madre and key

informant interviews with government officials and community members. Prior to the data gathering, coordination through various DENR offices and non-government organizations were made, and, in the case of Bukidnon, the blessing of indigenous leaders was sought. In addition, the team adopted the research ethics guidelines of the Philippine Social Science Council (PSSC), seeking prior informed consent and protecting the identity of the participants by anonymizing their names and not disclosing their specific locations within a general area (e.g., province, mountain range, national park).

Audio recordings of FGDs and KIIs were transcribed and gathered in an NVivo 11 database. Following grounded theory methodology, an open reading of the transcripts was performed to identify major themes, which were then used to re-read the transcripts to identify passages that are relevant to those themes, which are presented in the following section. To protect the identity of the informants, pseudonyms are used throughout this paper.

## Findings

### Demographic Profiles

The forest guards we encountered can be grouped into two major clusters: (1) direct employees of government agencies (e.g., DENR and the University of the Philippines Los Baños or UPLB) and (2) volunteers supported by different entities, from NGOs to local government units, who engage with DENR on an indirect basis. The DENR employees can be further subdivided into regular employees with *plantilla* (i.e., permanent) positions and contractual or job-order workers, while the volunteers are a more heterogeneous cluster, even as many of them come from indigenous communities. The two clusters have distinct differences in terms of the profiles of those belonging to them.

The DENR employees, for instance, are all at least high-school graduates, and most have completed some years of college. Most of them do not belong to indigenous communities. While there is a plurality of rangers who took BS Forestry and environment-related courses, there is a diversity of educational backgrounds. Importantly, the rangers in name (there is a government position of “Forest Ranger”) may not necessarily be rangers in function (i.e., conducting fieldwork); they may end up doing clerical or office-based work and are only designated as forest rangers for bureaucratic purposes. Moreover, not all have *plantilla* positions (the most common item, “Forest Ranger,” is classified under Salary Grade 4 with an annual salary of PHP152,088 as of the time of writing), with others taking contractual posts (e.g. “Forest Protection Officer”). Either way, the entry point to becoming a forest ranger is by getting hired by local DENR offices—sometimes with the help of a “backer.”

“Volunteers,” meanwhile, are mostly primary- or secondary-school graduates who are either residing in the forest themselves, mostly as part of indigenous communities. As volunteers, their work is part-time (e.g., twice-monthly patrols),

but their level of involvement varies depending on projects (e.g., reforestation) and emergencies (e.g., forest fires). In some communities, being a volunteer guard is lifelong, hereditary, and titular. As such, the age range is quite wide, and in many communities they also tend to be older (> 50 years).

An overwhelming majority of the forest guards we interviewed were males, but there were also a few female participants, likely reflecting the demographic picture throughout the country.



### **Motivations and Rewards of Being a “Forest Guard”**

The forest guards’ motivations range from professed love for the mountains to the need to earn one’s livelihood. While the employed guards emphasized the financial incentive, volunteers belonging to indigenous communities tended to frame their work in terms of duty, speaking of the forests as their material and spiritual homeland.

As JR, a Kitanglad Guard Volunteer (KGV) in his early 20s said:

Because I want to protect Mt. Kitanglad. For me, a new KGV, I want to protect Mt. Kitanglad because it gives us water, and as they say, it's our market. It's also our hospital because sometimes it's where we get our medicines from.

Marcelo, an older counterpart in his late 60s, shared similar sentiments:

As God said, love my creation. For us, we learned to love our mountain because God created it for humans, not for himself. Thus, it is good for us to love the mountains. To have love for the environment. [Because] God made the trees, animals, and others for our good. That's what we do, we protect God's creation. We are old, but we have grandchildren and I hope that someday they will look at the mountain and say, “this was protected by our grandfather.”

These spiritual and philosophical discourses are not confined to indigenous volunteers alone. Paul, a *guardia monte* in Los Baños in his late 20s, for instance, stated that his love for the mountain started as a college student in UPLB: “*Napamahal na ako kay Maria Makiling* (I grew to love Maria Makiling).” Related to the above, some also speak of health and the opportunity to see beautiful things. To be a forest ranger, as one from Nueva Ecija said, is “*maganda sa katawan* (good for the body),” a sentiment echoed by other guards.

Finally—and perhaps most significantly—we can also glean a sense of belonging among the rangers, many of whom work as a team. This is particularly true for the volunteers, who, while paid very little, nonetheless

derive some social capital from their position. Beyond the interview proper, such sense of belonging manifests in the pride many guards place in their uniforms and their identification as “frontliners.”

Altogether, we find overlapping reasons, from the philosophical to the pragmatic, informing people’s motivations to be a forest guard.

### The Roles of A Forest Guard

#### Regular tasks

Both employed and volunteer guards say that their main task is to patrol the forests and monitor illegal activities that vary from place to place, from logging and mining to the establishment of illegal settlements. The main difference between the two groups is the frequency: while the employed guards typically do weekly patrols, the volunteers are expected to do the same only once or twice a month. For instance, in Mount Kitanglad, some volunteer guards recount that:

**JEFFREY:** In one month, sir, I patrol for one day; we have a gadget to observe the environment. We observe if there's no illegal [activity] and also the presence of animals.

**GIDEON:** So that's it?

**JEFFREY:** Yes, sir, that's it.

Employed guards, moreover, also take part in enforcement activities, often in cooperation with police or military, including going to duty on checkpoints and participating in “raids” and apprehensions. Moreover, they also perform clerical duties including filing reports and facilitating paperwork. For their routine tasks, the employed guards note the physical demands of fieldwork—of having to walk all day—and some of the older ones blame their occupation for joint pains.



#### Special activities

Beyond these routine tasks, there are also special activities, such as projects funded by non-government organizations. For instance, forest guards in various sites mentioned their involvement in the Lawin Forest and Biodiversity Protection System, an initiative funded by the United States Agency for International Development (USAID) and institutionalized by the DENR in 2018, which makes use of a tablet app to enable streamlined, real-time monitoring of wildlife and illegal activities (Rocamora 2018), as well as the National Greening Project (NGP) (Israel 2016). When I asked the forest

guards in Mount Kitanglad how many trees they have planted as part of the NGP, one of them said, “around five.” When I incredulously repeated my question, he said, “Yes, five. Hectares.”

For volunteers these special projects are ways to greatly augment their allowance, but the projects can also cause friction because they do not always involve all the guards. In one meeting of a bantay gubat organization we attended, for instance, some members questioned their leader on how an NGO grant amounting to a few million pesos was spent. In Bulacan, where at least four volunteer groups occupy the same area, some key informants noted how local politics (i.e., between the groups, the local DENR offices, and other actors) determine which particular groups get prioritized—including being hired or contracted as a bloc—in DENR-initiated projects.

Other ad-hoc activities include attending to emergencies. In Bukidnon, both the employed and volunteer guards said they participated in firefighting during the 2016 fires in the Kitanglad Range, as well as in smaller, more recent episodes. Underscoring the challenges of firefighting, they referenced Alex Banilar and Wilfredo Baticon, two of their colleagues who died while responding to a forest fire that hit a portion of the 500 ha Bukidnon Provincial Tree Park in April 2018. In Mount Makiling, a popular hiking destination, a more common emergency is rescuing missing hikers on weekends, for which they are “on-call.”

The employed guards also cite another special activity: testifying in court for cases involving illegal activities, for which they serve as witnesses. These court cases, according to the guards, can drag on for years, and given the security risks involved, they do not look forward to these court hearings. One ranger in Mount Makiling, for instance, referenced the case of Elipidio “Jojo” Malinao, who was killed in May 2011 right after a court hearing involving a case of illegal settlements in the mountain.

### **Key Relationships**

The forest guards underscore the importance of relationships with various community members and stakeholders, most especially mayors and barangay captains. Politics can be a challenging terrain: In one barangay in a municipality in Bukidnon, the volunteer guards complained that the mayor pressured them to make one of his men a member, in contravention of their own rules which state give them the sole power to appoint new members. Given that their allowance is given per team and divided into the number of members (in one barangay, for instance, it was PHP 5,000 divided by 12), another member would mean less allowance for each of them. But because they needed to work with the mayor, they relented to his demand.

Meanwhile, there is also the frustration in some sites over the knowledge that local officials themselves are involved in corrupt activities. “How can we go against them, when their backer is *nasa loob* (within the office)?” as one ranger in Nueva Ecija said. One limitation of the research is that the data gathering

was facilitated in the auspices of DENR, which may have prevented the rangers from more fully articulating, and the researchers from probing, these internal issues, but the fact that they were hinted at by the guards is notable.

Even so, there were also sites where the support of the mayor is empowering, as one DENR ranger from Gabaldon, Nueva Ecija shares:

Here in our town, the mayor himself says that logging is not allowed, not even furniture. And he himself will give a cash award if we're able to catch the *illegalistas*. That's a good thing because it encourages us, we have his backing.

The ranger's colleagues add that Typhoon Lando, which caused catastrophic flooding in Central Luzon in 2015, made people in their town realize the devastating effects of illegal logging, which is why people (and politicians) are wary of it.

In some areas, indigenous leaders, soldiers, and rebel groups were also cited as key people with whom good relationships are essential. Where both are present in one jurisdiction, the employed guards see the volunteers as their partners: "They are our eyes and ears on the ground," as one Bukidnon forest ranger said of the Kitanglad Guard Volunteers. For their part, however, some volunteers feel that while they are the true frontliners, they receive much less compared to the forest rangers, even as they do not feel the latter's presence. As one bantay gubat in Bukidnon said: "They hardly go here, they hardly climb the mountain, and yet they get paid much more."

Particularly for the volunteer groups, one final key relationship they identified is the members of their own communities, including their relatives or family. While many community members share the guards' outlook and goals, others are, in the words of one guard in Nueva Ecija, *pasaway* (disobedient) and are difficult to deal with given their personal relationships. As JR shares from his experience as a young bantay gubat in Bukidnon, these tensions can undermine conservation but can also facilitate it:

I knew it was my uncle who was behind the [illegal construction], and I couldn't bring myself to confront him. But one of my uncles was also a bantay gubat, so I told him about it. He was the one who took care of it.

In areas where the volunteer guards' associations enjoy a prominent role in interfacing with government agencies, there may also be some friction between them and indigenous leaders. In Bukidnon, for instance, we witnessed a traditional conflict resolution ceremony between tribal chieftains and the leaders of the forest guards, with the former feeling left out in funding opportunities, and the latter feeling undermined in their positions. In the Sierra Madre, meanwhile, we saw different groups of bantay gubat having tensions regarding jurisdictions and allocations of allowances from the DENR and other agencies.



Figure 2. Kitanglad  
Guard Volunteers and  
author in Imbayao,  
Malaybalay, Bukidnon

### **Qualities**

Given the above tasks, special activities, and relationships, the guards spoke of qualities that they need to be effective in their work, most common of which are courage (*tapang, lakas ng loob*), physical fitness (*lakas, tibay*) and diplomacy (*pakikisama* or *pakikitungo sa tao*).

“When you’re in the forest, you’re on your own,” Geoffrey, one ranger from Aurora told us. “You need to be strong and brave, but above all, you need to be able to talk your way out of any situation.” He shared that he would sometimes offer coffee to those he would apprehend or warn for environmental violations, making them less hostile before he confronts them: “*Kumbaga pakakapehin mo para at least kahit papano, mabawasan ’yong self—mawala ’yong sama ng loob niya* (You serve them coffee so that at least their sense of embarrassment is lessened.”)

### **Needs and Aspirations**

When I asked Edgar, a 31-year-old volunteer guard in Bukidnon, about their needs, he responded:

Any protection will be a great help. Firearms may not be possible because we’re not allowed to have them. But I hope they give us protection as forest guards. For example, we need radio, food, higher pay. When it gets hot in the forest, we are like firefighters, the firefighters of the forest. We stop the fires and we also need equipment for that.

He proceeded to highlight the perils of their job, pivoting to a plea for more financial compensation:

Our job is hazardous, there are many threats to our life but no matter how dangerous, we are trying our best. But we really hope they increase our pay. Our older members, we hope they will get a retirement benefit since they’ve

been working for so long. When they stop working, we hope they will be some help from the government. That's all they are asking for.



Edgar's words capture the sentiments of most, if not all, forest guards: a paramount need for more financial compensation, as well as requests for more equipment. In the first place, whether they have plantilla positions and earn PHP 13,000 a month or are volunteers getting a monthly allowance of a few hundred pesos, forest guards feel that they are underpaid, even as those who have regular positions consider themselves *suwerte* (fortunate), citing the many others who would be willing to take their jobs. Nonetheless, there is an overall desire for higher wages (or allowances). One forest ranger in Bukidnon, for instance, pointed to the salary increase among the uniformed services to argue that they, too, should receive the same, given that they also perform some enforcement functions. As Geoffrey, a DENR officer from Aurora, said, reforms must extend to their many contractual employees:

I hope our forest rangers will be classified as Salary Grade 4. Right now, we get PHP 12,000 to 13,000. I hope it is raised to PHP 18,000 so at least . . . because we are frontliners the mountain. And forest protection is not an easy task. I also hope they end contractualization; many of our staff deserve to be made permanent.

As for the volunteers, the demand for a higher salary or allowance varies even within one jurisdiction. For instance, the Kitanglad Guard Volunteers in Malaybalay City get more than the poorer neighboring towns, leading the volunteers in those towns to clamor for higher allowances, and we saw them raise this among the foremost concerns during the Aldaw ta Kitanglad celebration in 2019.

Beyond what they get on a regular basis, they raised hopes that they will get a range of monetary and non-monetary benefits. As one forest ranger in Aurora, for instance, said:

We hope to get hazard [pay], because we are prone to accidents when it comes to the mountain. We climb it and who knows, we might suffer a fall and we don't even have hazard [pay].

Many also pointed out the need for health insurance. As Ansastacio, a Bukidnon-based volunteer in his 60s shared:

I am old and without livelihood, I hope there's health insurance—ours is only for death and accidents. Even a small assistance will help.

Beyond their individual needs, the forest guards also articulated the need for more personnel. “Kulang na kulang kami (We’re severely understaffed),” as one protected area officer in the Sierra Madre told us, adding that the consequent overwork is exacerbating the physical toll of the job and the feeling of being underpaid.

Some of the rangers, however, consider themselves still more fortunate as compared to the people in their community, as they are relatively better off. Even so, they are hoping for higher compensation, as well as greater recognition. “I haven’t received anything, not even a certificate!” as one forest ranger in Bulacan told me. His and other narratives suggest that recognition can play a big role in making them feel valued, and in motivating them to continue their work.



### Views on Environmental Protection and Future Outlook

The final domain that we explored in the FGDs are the forest guards’ views on environmental protection, as well as their outlook on the future of the forests.

The forest guards are generally supportive of government programs to protect the forest, including reforestation, citing the improvements they have seen over the years. However, most of them agree that forest protection is more important than reforestation. As one leader of a volunteer group in Bukidnon said, “The forest can heal itself. All we need is to protect it.” Throughout our research sites, encroachment of communities and industries on forest lands was identified by the guards as the most significant threat:

As the population increases, if the environment lacks support, it will be damaged. People will creep up to the mountain (*gagapang nang gagapang sa bundok*) if the government does not pay attention.

Despite this overall view, however, the volunteer guards are divided in terms of indigenous uses of the forest itself, and whether they have more rights to forest resources as compared to lowlanders. A few, for instance, said that “we have to respect tradition” and tolerate their villagers’ activities, such as hunting wild boar and engaging in swidden farming. However, a majority seem to acknowledge that the practices of the past are no longer applicable today, as one elder in the Sierra Madre said:

It's different now. Back then, there were just a few people but now there's many of us, we cannot continue doing what we used to do then.

One major concern shared by many volunteer guards, especially those in leadership positions, is sustainability—both of their organization and the support they get. “What happens next year, when the project is over?” one hired staff of a volunteer organization asked rhetorically, when the topic of NGO support came up. Among the volunteers, there is also a concern on how to recruit younger members, as this dialogue with a volunteer in Bukidnon shows:

**GIDEON:** You mentioned that you hope there will be people who would follow your footsteps. Why are they not joining?

**ALVIN:** Many want to join, but how can we accommodate them? That's the problem—we have such limited funds we cannot make them fit into it. That's the concern.

**GIDEON:** What about your family members?

**ALVIN:** There are, but again, would they accept PHP 400 a month? We cannot even buy enough rice from that, and even then, sometimes it gets delayed up to 6 months.

On top of financial constraints, some volunteer guards also problematized young people's attitudes, suggesting that they may be interested in seeking opportunities in the cities rather than staying in the communities. Despite the above concerns, the guards were cautiously optimistic about the country's environmental picture, citing the positive developments that have taken place since 10 or 20 years ago, even as this optimism is tempered by their assessment of the socioeconomic and security risks they face.

It is worth adding that beyond such strategic insights, forest guards demonstrate tactical knowledge that are likewise largely taken for granted, despite their potential to contribute to environmental work. In Aurora, for instance, some of the guards spoke of specific kinds of trees that are suitable for reforestation, while in Bukidnon, one leader of the volunteer guards spoke of “planting trees by the riverbanks” as their long-running but unheeded recommendation. Meanwhile, in Bulacan, the guards mentioned various root crops in the forest that can contribute to food security among mountain communities. Given the specificity of these insights, the FGDs were not able to explore them in-depth, but they nonetheless hint at the potential of the guards as sources of situated knowledge.



## Discussion

Many of the issues raised by the forest guards corroborate concerns already documented in various sources. The forest guards' concerns for their safety, for instance, resonate with reports that in the year 2018 alone, 30 "environmental protectors" were killed in the Philippines, including forest rangers and guards (Global Witness 2019), as well as news accounts of forest rangers (e.g., Bienvinido "Toto" Veguilla Jr, 44, a forest ranger of the CENRO in El Nido, Palawan; and Ronaldo Corpuz of the CENRO in Muñoz, Nueva Ecija) being killed all over the country (Fabro 2019; Geronimo 2019). Despite the decentralized nature of forest governance, our interlocutors identify with rangers all over the country and find solidarity with them. Likewise, they are also aware of policy issues like the debate about arming forest rangers (e.g., Gamil 2019) and the plan to create an "Enforcement Bureau" (Reyes 2019; Domingo and Manejar 2018).

Similarly, the guards' demands for more support, compensation, and recognition also mirror demands that have been raised all over the archipelago (e.g., Cinco 2020; Carandang et al. 2013). Moreover, their lament over the pervasiveness of politics and corruption is well documented in the environmental literature in the Philippines (Severino 1988; Dressler et al. 2006; Vanderveest and Peluso 2006; Van der Ploeg 2011; Mayo-Anda and Torres 2014; Barrer et al. 2017). As in other countries (e.g., Ghate 2003), these accounts have also implicated the guards themselves in a political economy that enables corrupt practices. As Van der Pleog and others (2011, 209) note: "In interviews, forest guards admit that confiscations are actually often staged to meet confiscation targets; *bugadores* surrender several boards at the DENR checkpoints to secure passage."

These recurrent themes notwithstanding, the findings offer new analytic insights with potential usefulness for policy and planning, namely: (a) "being a forest guard" as a source of identity and belonging; (2) the complicated role of indigenous people; and (3) the challenge of sustainability.



### **Identity and Belonging**

The findings make clear that the forest guards are proud to be bantay gubat and embrace it as part of their identity. Beyond the limited financial compensation and social capital that they gain from the position, the forest guards' narratives—and our own observations of their activities—make clear that they find a sense of identity, affirmation, purpose, and belonging in being a forest guard. They see themselves as advocates of the community and the environment, and as members of an organization that is recognized and well-regarded, in many settings. Moreover, the “personal commitment and dedication to the forest, often based on an emotional connection with the forest” that Lawrence (2011) documented among the foresters in Poland can also be said of the forest guards in the Philippines, suggesting similar motivations among “environmental frontliners” around the world.

Such sentiments can explain why many forest guards continue in their roles despite the difficulties and lack of monetary reward. As the literature around the world shows, forest guardians' motivations are often multiple, and often include conservation, social benefits, and economic opportunities (Allendorf et al. 2013). As with many of our informants, a value for aesthetics and indigenous traditions also comprise these overlapping motivations, although they are sometimes overridden by more pragmatic concerns (Muttaqin 2019).

While these motivations can enhance their contributions to forest conservation, they can also undermine forest governance, and this is particularly true for the volunteers. The paramount loyalty to the group or village, for instance, can pit groups of volunteer guards against each other, as we saw in Bukidnon and Bulacan; and can also cause friction within their own communities. In light of the plan to arm guards as part of an “Enforcement Bureau,” also at stake in the guards’ conflicted loyalties are questions of securitization and (further) militarization, especially in light of a long history of forest guards being used in the service of political and economic interests—and already-militarized forests lands all over the country (Dressler and Guieb 2015; Gatmaytan 2018).

Moreover, the fact that being a bantay gubat is seen as a source of identity can contribute to people’s determination to hold on to the position beyond their active years, or regard the position as hereditary. All of the above can diminish the effectiveness of the group.



### Local Relationships and Indigenous Knowledge

As mentioned in the introduction, various works have been written in the country that situate forest protection and indigenous peoples in relation to each other, particularly in the wake of the global paradigm shift toward embracing indigenous communities as partners in protected areas (Nepal 2002). Notable among them include Dressler's (2006) account of "coercive" and "community-based" conservation in Palawan and how both of these modes have constrained the livelihood of the Tagbanua, as well as Perez's research in Mount Pulag National Park (2018) that charts the "interface" between what she calls "agents of environmentalism" and indigenous peoples.

Our findings suggest that indigenous needs and aspirations can truly clash with the imperatives of forest protection (and protectors), and that such tensions can play out at the interpersonal level: while many guards spoke of forest conservation as their primary motivation, the same cannot be said of other community members, especially given the continued economic appeal of logging and other activities. Moreover, the very existence of bantay gubat organizations can be perceived as a threat by tribal leaders who may see their position challenged—even though in the sites we visited, the relationship was largely friendly and cooperative, with mechanisms in place to resolve conflict.

On the other hand, indigenous knowledge can also inform forest protection in powerful ways. Indeed, the indigenous forest guards have a spiritual and ecological outlook on the mountains that can be an invaluable resource for empowering forest guards, their communities, and the general public. Indeed, the discourse of "the mountain as home" can frame environmental conservation in more positive terms, alongside the more reactionary message of forest conservation to avert ecological destruction. Notably, the indigenous insights elicited in our study resonate with the findings of Camacho et al. (2016, 11) in Ifugao where they found the *muyong* system to be rooted in a worldview that "harmonizes the mutual connections between human and natural resources." Closer to our sites, Cairns (1997, 52) has documented the widespread perception among the indigenous communities in Bukidnon that "nature is governed by guardian spirits that must be shown respect" and that such views have "buffered" the forests of Kitanglad "from over-exploitation by the highest possible authority—the spirit world" (*ibid.*, 55). These same perceptions, alongside the tribal leaders' own role in pushing for the bantay gubat system in Kitanglad, strongly suggest that overlaps between ancestral domain and national park can be "mutually supportive."

The forest guards' "tactical knowledge," although only superficially explored in the FGD, likewise find resonance in previous literature. Cairns, for

instance, writes that indigenous knowledge and traditional resource management “should form the basis of efforts to restore the buffer zone’s ecology,” owing to community members’ knowledge of the properties of various trees—and affinity of species to each other (e.g., *lawaan* or lauan as the favored tree of the Philippine eagle) (1997, 68). Valuing this knowledge should take a sense of urgency given that, as the literature suggests, their bearers are fast disappearing (e.g., Camacho et al. 2016), echoing the questions of sustainability raised throughout this chapter, and broadening them to every complexity of indigenous ways of life.



### Sustainability

This brings us to the final discussion point: the question of sustainability, particularly for the volunteer guards. In most of the sites we visited, the rangers were in their 50s and older, and while there were a few young people, many are not even capable of doing fieldwork anymore, serving more as titular guards even as they continue to take leadership roles and receive a share of the guards’ allowances.

The volunteer guards themselves share this concern over sustainability, framing it in terms of generational difference (e.g., “More young people are heading to the cities in search of jobs”), as well as a function of limited support (“How can you attract young people when all we get is an allowance?”). If their observations are correct, then forest protection may face a decline in its auxiliary forces in the coming years and decades—unless the guards receive more support, and the indigenous communities themselves are supported in ways that can attract future generations to continue living and working there.

Meanwhile, another related concern is the sustainability of funding from NGOs, given the project-based nature of their support, as well as from LGUs, given the arbitrariness of funding (e.g., depending on the mayor or governor in charge). Institutionalizing support for forest guards through enactment of enabling laws can help mitigate this concern, while NGOs should also think of how their projects can contribute to addressing the challenge of sustainability, mindful that their efforts and very presence can have unintended consequences for forest communities (see Novellino and Dressler 2009).



## Summary and Conclusion

Recognizing the multiple motivations that inform forest guards' work should also lead to further investigations of the "micro-politics" (see Kolstad and Søreide 2009) in their lifeworlds. In a study of local corruption in natural resource management in India, for instance, Robbins (2000, 440) noted that instead of just focusing on institutional reform, anti-corruption efforts "must be centered instead on the skewed patterns of social capital that pre-exist the state resource management system; localized power requires localized institutional reconfiguration." In the case of the volunteer forest guards, our analysis shows that a sense of belonging and identity informs their work, and while their "social capital" lies in their dual position as community members and environmental workers, their strategic and tactical knowledge—including those from indigenous heritage—have not been recognized, and their level of participation has been minimal, mirroring the status of community organizations despite decades-long calls for participatory environmental governance (Gera 2016). While there have been successes, including in Bukidnon (see Broad and Cavanagh 1993), these continue to be few and far between, with civil society initiatives often unable to challenge political pressures (Vitug 1997).

Alongside the urgent security and financial challenges reiterated by our findings, one significant concern raised by the guards themselves is that of sustainability. Toward this end, some proposals put forward by the DENR and other environmental actors have involved economic activities such as ecotourism and agroforestry (e.g., Friess et al. 2016; Carada 2017; Galang and Vaughter 2020)—and indeed, the sites we have visited are amenable to such activities. However, considering the COVID-19 pandemic, questions of sustainability remain unresolved and will need further examination.

Taken together, our recommendations serve as further impetus for policy reforms: beyond legislative initiatives to hire more rangers and give them more benefits, programs must consider the rangers' own insights on governance, act on their sustainability concerns, and anticipate the implications of the guards' relationships with community members and other key actors (e.g., regularly employed forest rangers).

Meanwhile, in terms of research, we recommend exploring other sites to further refine the typologies, findings, and insights we gathered, and to revisit

our sites and elicit more voices within them. One limitation of the study was the conduct of research mostly under the auspices of their offices, which may have prevented some forest rangers from opening up about problems within their own bureaucracies—including about sensitive matters like corruption and militarization—and this limitation can be overcome by longer-term engagement with the rangers and participant observation.

Moreover, while we foregrounded the hitherto-overlooked perspectives of forest guards, it would be useful to also account for the perspectives of community members, including women who are also involved in forest protection, as well as other key actors like NGOs and people's organizations (see Severino 1998). Specifically for indigenous communities, this exercise should include local conceptions of forests, mountains, the environment, and human-environment relations. Exploring indigenous notions of ecology and sustainability (cf. Throsby and Petetskaya 2016) will not only foster a greater appreciation of indigenous knowledge, but pave the way of such knowledge being used in bringing about a fuller, deeper understanding of our forests and why we must protect them.

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## ANNEX 1. Dates, locations, and participants of the 12 FGDs

DATE	LOCATION	PARTICIPANTS
17 August 2019	Sitio Intavas, Impasug-ong	Kitanglad Guard Volunteers
17 August 2019	Brgy. Imbayao, Malaybalay	Kitanglad Guard Volunteers
19 August 2019	Brgy. Songco, Lantapan	Kitanglad Guard Volunteers
7 October 2019	Pangantucan, Bukidnon	Bantay Lasang Volunteers
20 October 2019	Norzagaray, Bulacan	Bantay Gubat
21 October 2019	Cabanatuan, Nueva Ecija	Forest Rangers (CENRO)
24 November 2019	Casiguran, Aurora	Forest Rangers (CENRO)
25 November 2019	Daraitan, Tanay, Rizal	Bantay Gubat
3 December 2019	Los Baños, Laguna	Forest Rangers (UPLB)
17 February 2020	Los Baños, Laguna	Forest Rangers (UPLB)
21 February 2020	Malaybalay, Bukidnon	Forest Rangers (PENRO)
5 March 2020	Tumauini, Isabela	Forest Rangers (CENRO)

## ANNEX 2. Typical profiles of forest guards in study sites

	EMPLOYED GUARDS	VOLUNTEERS
Affiliations	DENR, local government, government agencies, and state institutions (e.g., UP Los Baños)	NGOs, people's organizations, local government units (often deputized by DENR agencies)
Background	At least high school graduates, and most have least completed some years in college. Most of them do not belong to indigenous communities; mostly male	Mostly primary or secondary school graduates who are either residing in the forest themselves, mostly as part of indigenous communities; mostly male
Age	Early 20s up to age of retirement (60s)	Mostly in their 40s to 60s with only a few in their 20s

## ANNEX 2 (CONT'D)

Salary or allowance	Around PHP 11,000–20,000 a month from their employer	A few hundred to a few thousand a month—from various sources (LGUs, NGOs)
Regular tasks	Office work, weekly patrols	Once- or twice-monthly patrols, participation in activities (e.g., seminars)
Occasional tasks	Emergency response, testifying in court cases, other activities as mandated by superiors	Special projects (e.g., reforestation); emergency response (e.g., forest fire); other activities by the barangay, LGUs, and DENR

## References

- Acebedo, V. A. 1999. Participatory Analysis of Plant Resource Management on Bohol, Philippines. PhD diss., Ateneo de Manila University.
- Allendorf, T. D., R. Das, A. Bose, B. Ray, K. D. Chaudhuri, S. Brock, and R. H. Horwich. 2013. Motivations of the Community Forest Protection Forces of the Manas Biosphere Reserve in Assam, India. *International Journal of Sustainable Development & World Ecology* 20 (5): 426–432.
- R. L. Austin and J. F. Eder. 2007. Environmentalism, Development, and Participation on Palawan Island, Philippines. *Society and Natural Resources* 20 (4): 363–371.
- Barrer, R. R., J. N. Torres, and M. Caleda. 2017. Identifying Corruption Contact-Points: Fine-Tuning Priorities for REDD Governance in the Philippines. ASOG Working Paper 17-011.
- Bankoff, G. 2004. "The Tree as the Enemy of Man": Changing Attitudes to the Forests of the Philippines, 1565–1898. *Philippine Studies: Historical and Ethnographic Viewpoints* 52 (3): 320–344.
- Broad, R. and J. Cavanagh. 1993. *Plundering Paradise: The Struggle for the Environment in the Philippines*. Oakland, CA: University of California Press.
- Cairns, M. 1997. Ancestral Domain and National Park Protection: Mutually Supportive Paradigms? A Case Study of the Mt. Kitanglad Range National Park, Bukidnon, Philippines. *Philippine Quarterly of Culture and Society* 25(1/2), 31–82.
- Camacho, L. D., M. S. Combalicer, Y. Yeo-Chang, E. A. Combalicer, A. P. Carandang, S. C. Camacho, and L. L. Rebugio. 2012. Traditional Forest Conservation Knowledge/ Technologies in the Cordillera, Northern Philippines. *Forest Policy and Economics* 22: 3–8.
- Camacho, L. D., D. T. Gevaña, A. P. Carandang, and S. C. Camacho. 2016. Indigenous Knowledge and Practices for the Sustainable Management of Ifugao Forests in Cordillera, Philippines. *International Journal of Biodiversity Science, Ecosystem Services & Management* 12 (1–2): 5–13.
- Canoy, M. E. L. S. and Suminguit, V. J. 2001. The Indigenous Peoples of Mt. Kitanglad Range Natural Park. Social Watch Philippines Case Study. Action for Economic Reforms. [https://aer.ph/pdf/sw2001/articlef2001\\_phi.pdf](https://aer.ph/pdf/sw2001/articlef2001_phi.pdf)
- Carada, M. C. 2017. Indigenous People (IP) Within a Managed Ecotourism Business: A Case Study of the Pamu-Laklakin Forest Trail (PFT) in the Philippines. *Journal for Information, Study and Discussion of Global Resource Management* 3: 1–25.
- Carandang, A. P., L. A. Bugayong, P. C. Dolom, L. N. Garcia, M. M. B. Villanueva, and N. O. Espiritu. 2013. Analysis of Key Drivers of Deforestation and Forest Degradation in the

- Philippines. Manila: Deutsche Gesellschaft fur Internationale Zusammenarbeit.
- Charmaz, K. and L. Belgrave. 2012. Qualitative Interviewing and Grounded Theory Analysis. *The SAGE Handbook of Interview Research: The Complexity of the Craft*, 2nd ed., 347–365.
- Cinco, M. 2020. Protection Sought for “Underrated” Palawan Forest. *Philippine Daily Inquirer*, 13 January. <https://newsinfo.inquirer.net/1212076/protection-sought-for-underrated-palawan-forest>.
- Domingo, S. N. and A. J. A. Manejar. 2018. Forest Protection in the Philippines. *Philippine Institute for Development Studies Discussion Paper Series* 2018-53.
- Dressler, W. H., C. A. Kull, and T. C. Meredith. 2006. The Politics of Decentralizing National Parks Management in the Philippines. *Political Geography* 25 (7): 789–816.
- Dressler, W. H. 2006. Co-Opting Conservation: Migrant Resource Control and Access to National Park Management in the Philippine Uplands. *Development and Change* 37 (2): 401–426.
- Dressler, W. H. 2009. Resisting Local Inequities: Community-Based Conservation on Palawan Island, the Philippines. In *Agrarian Angst and Rural Resistance in Contemporary Southeast Asia*, edited by D. Caouette and S. Turner, 102–124. London: Routledge.
- Dressler, W. H. and Guieb III, E. R. 2015. Violent Enclosures, Violated Livelihoods: Environmental and Military Territoriality in a Philippine Frontier. *Journal of Peasant Studies* 42 (2): 323–345.
- Fabro, K. A. 2019. El Nido Forest Ranger Hacked to Death. *Rappler*, 5 September. <https://www.rappler.com/nation/239460-el-nido-forest-ranger-hacked-death-september-2019>.
- Friess, D. A., B. S. Thompson, B. Brown, A. A. Amir, C. Cameron, H. J. Koldewey, and F. Sidik. 2016. Policy Challenges and Approaches for the Conservation of Mangrove Forests in Southeast Asia. *Conservation Biology* 30 (5): 933–949.
- Galang, E. I. N. E. and P. Vaughter. 2020. Generational Local Ecological Knowledge on the Benefits of an Agroforestry Landscape in Mindanao, Philippines. *Asian Journal of Agriculture and Development* 17 (1362-2020-1102): 90–108.
- Gamil, J. 2017. DENR Mulls Arming Forest Rangers. *Philippine Daily Inquirer*, 30 September. <https://newsinfo.inquirer.net/934516/denr-roy-cimatu-arming-forest-rangers>.
- Gatmaytan, A. B. 2018. Living with the Promise of Violence: The State and Indigenous People in a Militarized Frontier. *Philippine Studies: Historical and Ethnographic Viewpoints* 66 (2): 219–244.
- Geronomo, J. Y. 2019. Forest Ranger Killed in Nueva Ecija. *Rappler*, 28 October. <https://www.rappler.com/nation/243598-forest-ranger-killed-nueva-ecija>.
- Global Witness. 2019. Enemies of the State: How Governments and Business Silence Land and Environmental Defenders. <https://www.globalwitness.org/en/campaigns/environmental-activists/enemies-state/>.
- Israel, D. C. 2016. Taking Stock of the National Greening Program Six Years Hence. *Philippine Institute for Development Studies Policy Note* 2016-26.
- Kohn, E. 2013. How Forests Think: Toward an Anthropology Beyond the Human. Oakland, CA: University of California Press.
- Kolstad, I. and T. Søreide. 2009. Corruption in Natural Resource Management: Implications for Policy Makers. *Resources Policy* 34 (4): 214–226.
- Lantican, C. M. 2001. Communication and Creation of Communities Towards Sustainable Management of Forests. PhD diss., University of the Philippines Diliman.
- Lasco, G., J. Mendoza, and Aldama, P. forthcoming. Conservation, Conflict, and Change: A Review of the Social Science Literature on Forests in the Philippines.
- Lasco, R. D. and Pulhin, J. M. 2006. Environmental Impacts of Community-Based Forest Management in the Philippines. *International Journal of Environment and Sustainable Development* 5 (1): 46–56.
- Mayo-Anda, G. and J. N. V. Torres. 2014. The Political Economy of Corruption and REDD+: Lessons from the Philippines’ Pilot Sites. *U4 Issue* 7.

- McDermott, M. 2000. Boundaries and Pathways: Indigenous Identities, Ancestral Domain, and Forest Use in Palawan, the Philippines. Conference Paper, Meeting of the International Association for the Study of Common Property, Bloomington, Indiana, 31 May–4 June.
- Minter, T., J. van der Ploeg, M. Pedrablanca, T. Sunderland, and G. A. Persoon. 2014. Limits to Indigenous Participation: The Agta and the Northern Sierra Madre Natural Park, the Philippines. *Human Ecology* 42 (5): 769–778.
- Moran, E. F., and E. Ostrom, eds. 2005. *Seeing the Forest and the Trees: Human-Environment Interactions in Forest Ecosystems*. Cambridge, MA: MIT Press.
- Muttaqin, M. Z., I. Alviya, M. Lugina, and F. A. U. Hamdani. 2019. Developing Community-Based Forest Ecosystem Service Management to Reduce Emissions from Deforestation and Forest Degradation. *Forest Policy and Economics* 108 (101938).
- Nepal, S. K. 2002. Involving Indigenous Peoples in Protected Area Management: Comparative perspectives from Nepal, Thailand, and China. *Environmental Management* 30 (6): 0748–0763.
- Novellino, D. 2003. Contrasting Landscapes, Conflicting Ontologies: Assessing Environmental Conservation on Palawan Island (the Philippines). In *Ethnographies of Conservation: Environmentalism and the Distribution of Privilege*, edited by D. G. Anderson and E. Berglund, 171–188. New York/Oxford: Berghahn Books.
- Novellino, D. and W. H. Dressler. 2009. The role of “hybrid” NGOs in the conservation and development of Palawan Island, The Philippines. *Society and Natural Resources* 23 (2): 165–180.
- Opiso, E. M., V. T. Quimpang, E. P. Leaño, G. L. Galan, F. M. Acma, F. P. Coritico, and V. B. Amoroso. 2014. Assessment of Biodiversity and Water Quality in Association with Land Use in the Alanib River, Mt. Kitanglad Range Park, Philippines. *Asian Journal of Biodiversity* 5 (1).
- Perez, P. 2018. *Green Entanglements: Nature Conservation and Indigenous Peoples' Rights in Indonesia and the Philippines*. Quezon City: University of the Philippines Press.
- Pulhin, J. M. and J. T. Dizon. 2003. Politics of Tenure Reform in the Philippine Forest Land. Conference Paper, Politics of the Commons: Articulating Development and Strengthening Local Practices, Chiang Mai, Thailand, 11–14 July.
- Pulhin, J. M., and W. H. Dressler. 2009. People, Power and Timber: The Politics of Community-Based Forest Management. *Journal of Environmental Management* 91 (1): 206–214.
- Reyes, G. 2019. DENR Appeals for the Creation of Enforcement Bureau. *Palawan Daily News*, 26 November. <https://palawandailynews.com/environment/denr-appeal-for-the-creation-of-enforcement-bureau/>.
- Robbins, P. 2000. The Rotten Institution: Corruption in Natural Resource Management. *Political Geography* 19 (4): 423–443.
- Rocamora, J. A. 2018. USAID, DENR Forest Protection Project Nears Completion. Philippine News Agency, 11 October. <https://www.pna.gov.ph/articles/1050738>.
- Severino, H. G. 1998. Opposition and Resistance to Forest Protection Initiatives in the Philippines: the Role of Local Stakeholders. United Nations Research Institute for Social Development Discussion Paper (UNRISD) No. 92.
- Throsby, D., and E. Petetskaya. 2016. Sustainability Concepts in Indigenous and non-Indigenous Cultures. *International Journal of Cultural Property* 23 (2): 119–140.
- Vandergeest, P. and N. L. Peluso. 2006. Empires of Forestry: Professional Forestry and State Power in Southeast Asia, Part 1. *Environment and History* 12 (1): 31–64.
- Van den Top, G. 2003. *The Social Dynamics of Deforestation in the Philippines: Actions, Options and Motivations*. Copenhagen: NIAS Press.
- Van der Ploeg, J., E. C. Bernardo, and A. B. Masipiquena. 2003. The Sierra Madre Mountain Range: Global Relevance, Local Realities. Conference Paper, 4th Regional Conference on Environment and Development, Cabagan, Isabela, May.

- Van der Ploeg, J., M. Van Weerd, A. B. Masipiqueña, and G. A. Persoon. 2011. Illegal Logging in the Northern Sierra Madre Natural Park, the Philippines. *Conservation and Society* 9 (3): 202–215.
- Vasan, S. 2002. Ethnography of the Forest Guard: Contrasting Discourses, Conflicting Roles and Policy Implementation. *Economic and Political Weekly* 37 (40): 4125–4133.
- Vitug, M. D. 1997. The Politics of Community Forestry in the Philippines. *The Journal of Environment & Development* 6 (3): 334–340.
- Williams, D. A., and K. E. Dupuy. 2019. Will REDD+ Safeguards Mitigate Corruption? Qualitative Evidence from Southeast Asia. *The Journal of Development Studies* 55(10): 2129–2144.



# INDIGENOUS FOREST LIVELIHOODS IN THE ANTHROPOCENE: Social-Ecological Assessment of Abacá (*Musa textilis*) and Giant Honey Bee (*Apis dorsata* F.) Indigenous Forest Enterprises through a Transdisciplinary Approach

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## Abstract

Biodiversity, Ecosystem Services, and Traditions (BEST) Forests was a transdisciplinary research study that combined ecological, economic, and sociocultural methods to respectively assess the biodiversity, ecosystem services, and traditions from indigenous forest products in the Bukidnon and Misamis Oriental landscape. Focusing on honey from giant honey bees (*Apis dorsata* F.) and *hinabol* fiber from abacá (*Musa textilis*) plants, BEST Forests assessed how mobile (giant honey bees) and immobile (abacá plants) agents shape both the livelihoods of indigenous peoples and the ecological integrity of a community forest landscape. Through the use of mixed methodology, BEST Forests found that from 2004 to 2019, the Normalized Difference Vegetation Index (NDVI) in the community forests managed by indigenous Higaonon people maintained statistically significant high values. Through gross margin analyses, BEST Forests found that honey and abacá enterprises have positive financial returns, with the seasonal honey enterprise potentially having higher gross margins. These results show that diversified livelihoods contribute to the ethnocompetitiveness of the Higaonon community and could decrease natural resource exploitation pressure on a single forest product. The NDVI analysis of the Higaonon community forest from the past 15 years shows that community forest enterprises could support indigenous livelihoods while maintaining forest cover. In the Anthropocene, it is worth exploring forest livelihood projects that promote multiple forest products and see whether they are more beneficial for forest-dependent peoples and their forest in the long-term than projects that only focus on one forest product.



## Introduction

Decreasing forest cover and persistent poverty are two long-standing challenges in Philippine forest communities. Strategies have mostly been adopted in silos, with protected area declaration as a common approach to maintain forest cover while social protection measures or cash-for-work programs were designed for poverty alleviation. Eventually, the protected area approach gained a reputation for being too focused on protecting trees and disregarding people in the process. Alternative approaches have been sought and, in 1989, a study by Peters et al. paved the way for integrated conservation and development in forest communities by concluding that “exploitation of non-wood resources would provide profits while conserving forests.” Thereafter, integrated conservation and development projects (ICDPs) focusing on non-wood or non-timber forest products (NTFPs) were implemented by governments and development organizations alike. However, it eventually became apparent that ICDPs such as community forestry enterprises (CFEs) have limited forest conservation and forest livelihood gains; enterprise-based conservation initiatives focused too much on economic returns, with the assumption that profits automatically translate to improved social well-being and increased biodiversity conservation (Lele et al. 2010; Peña 2010). This can be partly attributed to a failure in realizing that conservation will always be undermined unless poverty is alleviated and that poverty and conservation belong to different policy realms, which are difficult to integrate despite its seeming interdependencies: poverty reduction itself depends on the conservation of resources, but conservation must not compromise poverty reduction (Adams et al. 2004; Garnett et al. 2007; Shanley et al. 2015). In rural forest communities, NTFPs are not only important in their livelihoods but also for their health and nutritional needs (Arnold and Perez 2001; FAO 2014a; Shackleton et al. 2015). Globally, NTFPs are also foreseen to have a role in the Sustainable Development Goals (SDGs) such as on poverty eradication (SDG 01), on affordable and clean energy (SDG 07), sustainable communities (SDG 11), responsible production and consumption (SDG 12), climate action (SDG 13), and life on land (SDG 15) (FAO 2014a).

Implicit in the promotion of NTFPs is the concept of forest resource utilization, which revolves around questions of “how” and “by whom.” How are

the NTFPs used? Who uses the NTFPs? These questions touch upon the long-standing debate within conservation circles whether “sustainable use” of wild plant and animal species drives conservation or further degrades resources. In the Philippines, indigenous forest communities traditionally use NTFPs for subsistence. With the emergence of CFEs, traditional subsistence use of NTFPs eventually evolved to commercial use where harvest amount exceeded personal and/or household use. Often, the focus of research on NTFPs has been on resource sustainability (i.e., whether harvesting levels are sustainable) and overlooks risks and threats to local stakeholders (Bolwig et al. 2008; Hughes and Flintan 2001). This focus also implicitly assumes that local stakeholders and their natural resource management approaches are the drivers of resource degradation (Hughes and Flintan 2001). Species extinction rate due to human activity in tropical rainforests is one of the growths and impacts of human activity that Paul J. Crutzen referred to when he suggested to use the term *Anthropocene* to emphasize the central role of mankind in geology and ecology in the current geological epoch (Crutzen 2006). The concept of Anthropocene is said to facilitate research focus from problem definition to solution formulation (Jahn et al. 2016; Steffen et al. 2011). Drawing from the concept of Anthropocene, this chapter aims to determine how commercializing traditional forest products like honey and *hinabol* (handwoven fabric from abacá or *Musa textilis*) can improve the well-being of indigenous forest peoples and contribute to forest and biodiversity conservation by employing a social-ecological systems (SES) perspective.

From an SES perspective, BEST Forests considered the Forest Foundation Philippines grantee Non-Timber Forest Products Exchange Programme Philippines (NTFP-EP Ph) project at the Kimangkil-Kalanawan-Sumagaya-Pamalihi (KKSP) Mountain Range as it is an appropriate case to document and assess CFE impacts on both social (indigenous peoples) and ecological (forest) systems. BEST Forests employed a transdisciplinary approach in assessing the NTFP project in KKSP on academic and praxis levels. On an academic level, BEST Forests aimed to contribute in filling the research gap on species of honey bees other than the European honey bee, *Apis mellifera* L. (Hym.: Apidae). BEST Forests recognizes that there are nine species of honey bees, yet most of the research has been done on the European honey bee. In addition, eight out of the nine species are extant in Asia, making Asia the cradle of honey bee diversity (Koeniger et al. 2010). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) thematic assessment of pollinators, pollination and food production also recognized the lack of wild pollinator data in Africa, Latin America, Asia, and Oceania (IPBES 2016). It is, therefore, important to study the lesser-known species of honey bees to determine whether they are also being affected by similar problems of the European honey bee. On a policy level, this study has implications on both local and international valuation of honey from wild honey bees. Locally, wild honey has the same price as cultured honey from

the European honey bee, but there can be a quality difference that can impact people's health. With pests such as Varroa mites hounding the European honey bee, beekeepers have no choice but to use chemical miticides, traces of which can be found in the resulting honey (Koeniger et al. 2010). Wild honey bees are unmanageable bees and cannot be treated with miticides and they usually forage deep into the forest and not in agricultural lands, making their honey "organic by default." This is not recognized in the current market of honey locally. Internationally, the Codex Alimentarius standard for honey is based on only the European honey bee, making it difficult for other honeys to compete since their characteristics are different. On a praxis level, BEST Forests looked at the value chain of wild honey from giant honey bees (*Apis dorsata* F.) and abacá fibers (*Musa textilis*) and compared their profitability for indigenous livelihoods.



To support this chapter's aim, BEST Forests had three objectives:

- (a) map geographical coordinates of harvest areas of the indigenous community enterprise products hinabol and wild honey from giant honey bees (*A. dorsata* F.) through global positioning system (GPS);
- (b) analyze forest land cover changes through normalized difference vegetation index (NDVI); and
- (c) conduct an integrated value chain and gross margin analysis of the community enterprise products hinabol and wild honey through key informant interviews.

The research assessed provisioning and regulating ecosystem services as well as cultural ecosystem services, which are often overlooked in comparison with the previous two (Matias et al. 2017a). The following sections of the chapter addresses each objective of the research, with the next section providing a background on the study area and the research collaborators. It is followed by a third section on methodology and research approach, then a fourth one presenting the spatial mapping of the harvest areas alongside NDVI analysis, corresponding to the first and second objectives of BEST Forests. The fifth section addresses the third objective on value chain and gross margin analysis of the NTFPs, and the sixth concludes with a discussion of how NTFP harvesting in the Anthropocene could improve the well-being of indigenous forest communities while conserving forest biodiversity.



### Indigenous Abacá Weavers and Honey Gatherers of the KKSP

The provinces of Bukidnon and Misamis Oriental in Northern Mindanao are two of several focal landscapes of Forest Foundation Philippines due to their relatively high forest cover. Bukidnon is also home to several indigenous groups in the Philippines, with the Higaonon people as the least known of all. The Higaonon are mostly situated in the municipalities of Impasug-ong and Malitbog within their approximately 10,000 ha<sup>2</sup> of ancestral domain. One of these Higaonon communities is the *Agtulawon-Mintapod Higaonon Cumadon*, or AGMIHICU. The AGMIHICU community is led by their tribal chieftain, Amay Mantangkilan Cumatang, who is also the first Asian to be awarded the Darrell Posey Fellowship Award in 2012 (Balane 2012). In turn, each sitio is led by a tribal leader. In 2001, the AGMIHICU community started negotiating with the local government and other organizations to map their ancestral domain claim, which has been successfully delineated in 2003 (Abeto et al. 2004).

Known as “people of the living mountains” and “people of the wilderness,” the Higaonon live off activities such as farming; shifting cultivation of crops such as kamote or sweet potato, corn, beans, cassava, yam, tobacco, and peanut; hunting and gathering; and/or abacá weaving, which is their principal economic activity (Cajetas-Saranza 2016; Vidal 2013). As part of traditional Higaonon culture, the practice of weaving abacá to hinabol, a traditional colored hand-woven textile, is passed down from generation to generation among Higaonon women, with the Higaonon men harvesting the abacá fibers. Some Higaonon men also engage in hunting giant honey bees, which is a seasonal activity practiced by a select group of men who could endure the stings of the giant honey bees. The BEST Forests project team carried out eight months (May–December 2019) of ethnographic fieldwork with AGMIHICU.



One of the members of AGMIHICU is a group of Higaonon weavers named Kalandang Weavers (*kalandang* meaning “peace”), which is one of

the three groups of weavers found in Bukidnon (the others being Sunflower Weavers and Pauhangan Weavers). As hinabol weaving transitioned from a subsistence to a commercial livelihood strategy of the Higaonon community, different organizations such as NTFP-EP Ph and a local marketing arm called Lindungawan helped the weavers in selling their products to the mainstream market. NTFP-EP Ph is a collaborative network of non-governmental organizations (NGOs) and community-based organizations (CBOs) working with forest-based communities in strengthening their capacity to sustainably manage natural resources. The Mindanao office of NTFP-EP Ph is based in Malaybalay City in Bukidnon and it closely cooperates with Lindungawan as one of NTFP-EP Ph's green intermediaries in Mindanao.

Lindungawan offers cultural and environmental products of high quality and standard to its target market and is a trading partner of NTFP-EP Ph's national marketing arm Custom-Made Crafts Center (CMCC). The marketing mechanism of Lindungawan is designed to support the livelihood activities and products of forest-dependent communities and other cottage industries, particularly in Bukidnon and Misamis Oriental. Since 2004, NTFP-EP Ph has been helping the Higaonon in developing and promoting their hinabol products both locally and internationally. Through the years, they were able to develop a checklist for harvesters and weavers to be used during harvesting and weaving abacá. This checklist, called Good Hinabi Practice (GHP), was collaboratively developed by the abacá weavers and harvesters and staff of NTFP-EP Ph and Lindungawan and contains a series of questions that the community needs to answer before they can start weaving. Most of the questions were based on Fair Trade principles as well as on policies and standards developed through the Sustainable Hand Woven Eco Textile (SHWET) project supported by the Hivos Foundation Southeast Asia to ensure the welfare of all weavers with regard to weaving being a source of livelihood. The GHP revolves around five aspects: Authenticity, Environmental Accountability, Social Responsibility, and Quality. As of the year 2018, there is a total of 18 active Kalandang Weavers. The GHP highlights Sustainable Consumption and Production (SCP) to ensure that the harvest of natural materials used for weaving is still within the carrying capacity of the environment.

Despite being a seasonal occupation, honey hunting is also an important activity for the Higaonon. However, unlike abacá harvesting, honey hunting is believed to "run in the blood" of a select few as not all have the ability to go deep in the forest, hunt wild honey bees, and climb tall trees. Wild honey hunters of the Higaonon community belong to a group named Higaonon Amamag Malandang Olandok Gagaw (HAMOG), which has 25 active members that gather wild honey in their community forests. Aside from hunting giant honey bees and gathering wild honey, HAMOG also promotes cultural preservation for their indigenous community by employing cultural learning programs to the youth. They have also appointed leaders and officials to manage their CFE products such as wild honey, cassava chips, and others.

The forest enterprises of the Higaonon community show a labor-sharing structure that capitalizes on different gender roles.



### Transdisciplinary Research on Social-Ecological Systems

Working with the Higaonon requires social science expertise. From an anthropocentric perspective, they are also part of the natural environment, which falls within the purview of the natural sciences. The traditional disciplinary division in academia has caused the separate study of social and natural systems instead of jointly looking at their linkages and feedbacks (Berkes and Folke 2002). The concept of SES underscores the integrated nature of social and ecological systems, which are also captured in other terms such as coupled human-environment systems or coupled human and natural systems (Fischer 2015). The relatively new field of sustainability science is one of the new analytical approaches and types of science that emerged in response to the need to study the interaction between human and natural systems (Kates et al. 2001). Despite a lack of a common glossary or commonly shared research framework in transdisciplinary research, sustainability science commonly includes multiple disciplines aiming at solving societal and scientific problems through active engagement of stakeholders, practitioners, and researchers (Hirsch-Hadorn et al. 2006; Lang et al. 2012; Angelstam et al. 2013; Brandt et al. 2013). To achieve its goals of promoting sustainable development and understanding the fundamental character of interactions between nature and society, sustainability science requires a transdisciplinary approach (Angelstam et al. 2013). Transdisciplinarity is not only about the integration between different disciplines in interdisciplinarity, but also about the integration at the interface of scientific questions and societal problems (Jahn et al. 2012). A transdisciplinary approach can facilitate adequate problem orientation and can ensure integrative results (Campenni 2016). This was the approach employed in BEST Forests. With an aspiration to help shape social realities in indigenous forest communities, BEST Forests used joint learning processes between science and society (ISOE 2020).

BEST Forests implemented the transdisciplinary approach from conception until the end of the project. Prior to the drafting of the project

proposal, the project director of BEST Forests consulted NTFP-EP Ph on their Forest Foundation grant with the Higaonon in the KKSP Mountain Range for common problem framing. After initial agreement with NTFP-EP Ph, the project director of BEST Forests drafted its project proposal and designed the project with societal challenges in indigenous community forestry in mind. Upon approval of the project proposal, BEST Forests formed an interdisciplinary project team consisting of research assistants with academic training in either the natural or social sciences. NTFP-EP Ph also provided contact persons from their office in Bukidnon for closer collaboration.

BEST Forests started with a preparatory phase, which involved both formal and informal processes. For the formal process, the research assistants were mandated to undergo a cultural sensitivity session with NTFP-EP Ph, ethical research and health and security training with the project director, a basic mountaineering course with Viajero Outdoor Centre, and to complete an ethical clearance and health and security check. With the assistance of the NTFP-EP Ph project team in Bukidnon, BEST Forests sought free, prior, and informed consent (FPIC) from the Higaonon community through several meetings in the area. These consisted of (1) introductory meetings, (2) BEST Forests immersions, and (3) Higaonon ritual meetings, all of which served to build trust between the BEST Forests team and the Higaonon community represented by AGMIHICU. This period corresponds to the first phase of an “ideal” transdisciplinary research process (see Figure 1), where the aim is to combine social and scientific problems to create a common object of research (ISOE 2020).

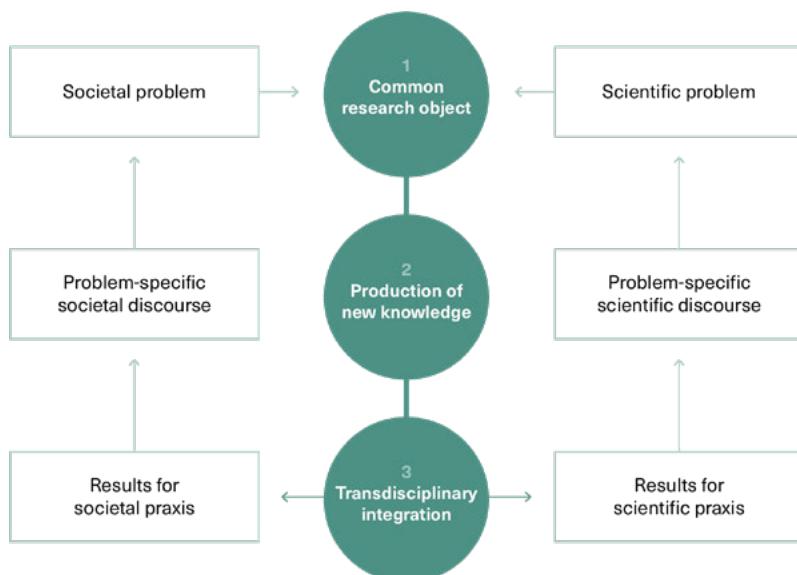


FIGURE 1. Transdisciplinary research process (ISOE 2020).

The second phase of a transdisciplinary research process focuses on the coproduction of new knowledge through collaborative data collection, which also involved skills building of the BEST Forests project team and AGMIHICU community members. The transdisciplinary approach of BEST Forests required a mixed methods approach that used both quantitative and qualitative methodologies. The research assistants were trained with the use of the global positioning system (GPS) equipment Garmin eTrex 20, which were used to collect geographical data in line with the first and second objectives of BEST Forests. In turn, the research assistants assisted a GPS trainer who was tasked to train community members who volunteered to gather geographical coordinates of giant honey bee nests and abacá plants. To address the third objective, the research assistants were also taught how to conduct participant observation, focus group discussions, key informant interviews, and questionnaire surveys in line with ethical research practices. All raw data were kept in a file sharing service with restricted access to uphold confidentiality and protect privacy and security of personal data.



Figure 2. GPS and digital camera training in the community.

Transdisciplinary integration, which corresponds to the third phase of a transdisciplinary research process, was done through data analysis and results diffusion with relevant actors throughout the duration of the project. The BEST Forests project team regularly communicated with NTFP-EP Ph and AGMIHICU and activity logs were regularly posted on the website of BEST Forests. The BEST Forests project team also presented the project and its preliminary results in two international workshops through talks and poster presentations. These international workshops had diverse participants coming from the academe, indigenous communities, NGOs, etc. and provided an opportunity for transdisciplinary discussion. Specifically, the BEST Forests project team was able to have an exchange with NTFP-EP Ph and give an update on the project's progress as well as discuss challenges that arose during project implementation (e.g., ambuscade during field work, field inexperience leading to poor decision-making in the field, etc.).

The scientific and praxis results of BEST Forests will be disseminated through this book chapter and in communications materials developed by the BEST Forests project team. Posters, infographics, and equipment instructional guides written in both English and in Visayan languages were given to the Higaonon community through NTFP-EP Ph and AGMIHICU. Equipment instructional guides were developed during the skills training for the use of GPS in geographical coordinates mapping and for the use of solar home systems, which were distributed as energy source of the abacá and honey CFEs of the community. An exit interview and final equipment turnover with the assistance of NTFP-EP Ph was conducted in July 2020, after having the initial turnover on March 2020 postponed due to the COVID-19 situation in the Philippines. As the BEST Forests project gained insight on the difficulties of indigenous forest livelihoods, this knowledge was also used by the project director of BEST Forests to raise funds through NTFP-EP Ph's Suporta para sa mga Katutubo Kontra COVID-19 for the Higaonon and other indigenous communities whose livelihoods were affected by the lockdown brought about by the COVID-19 pandemic. This exemplifies how a transdisciplinary approach could facilitate an integration of scientific and praxis results and how these could be used in finding solutions to societal problems.



### Spatial Mapping of Abacá Plants and Giant Honey Bee Nests

To address the first objective of BEST Forests, the local honey hunters and gatherers were trained to handle GPS and digital camera units. Following the framework of Matias et al. (2017b) on baseline mapping of a community forest through GPS, representative hunters from the different *gaop* or sitios from the indigenous community participated in the GPS and digital camera training held in July 2019 in the AGMIHICU tribal hall. A local trainer from Cagayan de Oro demonstrated the use and basic functions of the GPS equipment. After the three-day training, the local community harvesters were thoroughly trained to use and handle the GPS and camera units, as well as transcribe GPS coordinates and other important data on a data sheet.

From August to September 2019, the BEST Forests team went with the HAMOG honey hunters and employed participant observation of traditional

honey hunting and gathering in the AGMIHICU community forests. During this time, the spatial distribution of the giant honey bee nests was documented through geographical mapping using the GPS units and the digital cameras. According to the honey hunters, the flowers in the community forests start to bloom in March or April. During honey hunting, hunters usually start early in the morning and walk for a couple of hours to reach the location of a beehive. Hunters then start to prepare the necessary tools used for harvesting the hive. As they harvest, hunters prepare ropes called *uway* which come from a bamboo-like plant to wrap around their body as a harness as they climb the tree, and to place on tree branches to serve as a ladder as they climb the main tree. Hunters also gather *namu* leaves prior to harvesting and light these leaves until smoke is created in order to smoke out the honey bees from the hive. As they start to collect the honeycomb from the tree, they say a prayer and perform chants as they climb the main tree and smoke out the beehive. Usually, two to three honey hunters climb the tree to collect the honeycomb and they use a *balde* or bucket lined with sterile plastic to store the harvested beehive.



**FIGURE 3.** A honey hunter lights up *namu* leaves for smoking out bees.

On the other hand, abacá harvesters live in another sitio, and most of them are husbands of abacá weavers. Based on interviews conducted by the BEST Forests team, community respondents consider abacá harvesting as the second main source of income after farming. Abacá harvesting is typically learned during one's teenage years. During harvest, abacá harvesters use a bolo and two different kinds of tools called the lagitan and toksi. *Lagitan* is a tool used to obtain the fiber in an abacá plant, while *toksi* is a type of dagger used to pull or comb the strands of the fiber. The Higaonon people believe that the best time to harvest abacá fibers and to weave them is during a full moon, as they believe the fibers are of good quality during this time. Abacá harvesters gather the fibers so that their wives could weave them into hinabol

handicrafts to be delivered to Lindungawan. However, there are also instances that harvesters directly sell the abacá they have gathered to the nearest market in Kalabugao. Similar to the honey hunters, the abacá harvesters also conduct a ritual of thanks before and after harvesting.



**FIGURE 4.** Abacá harvester mapping geographical coordinates of abacá plants.

### Spatial Analysis of Abacá Plant and Giant Honey Bee Nest Locations

Volunteer honey hunters and abacá harvesters conducted the mapping of abacá plant and giant honey bee locations, which resulted in eight honey bee hives and 14 abacá harvest areas mapped. Spatial analysis was conducted on the GPS coordinates gathered through a normalized difference vegetation index (NDVI) of the community area. Satellite images from the vegetation of the community area were downloaded for the years 2004, 2016, 2017, 2018, and 2019. The year 2004 represents the baseline year when the community's abacá CFE began, while the year 2016 represents the start of the wild honey CFE intervention in the community. The researchers used freely accessible satellite images from Sentinel-2 except for the year 2004, which used images from the Landsat satellite. Through the use of the Point Sampling Tool of QGIS version 2.16, the NDVI values for the abacá plants and giant honey bee nests were extracted for comparison.

Weier and Herring (2000) of the NASA Earth Observatory classify NDVI as follows: very low NDVI values correspond to barren areas of rock, sand, or snow ( $\leq 0.1$ ); moderate values represent shrub and grassland (0.2 to 0.3); and high values indicate temperate and tropical rainforests (0.6 to 0.8). The range of NDVI values for Bukidnon are as follows, which show that maximum values correspond to high values that indicate rainforests:

**TABLE 1.** Minimum and maximum NDVI values for the whole community area in Bukidnon. The maximum values show high NDVI values consistent with tropical rainforests.

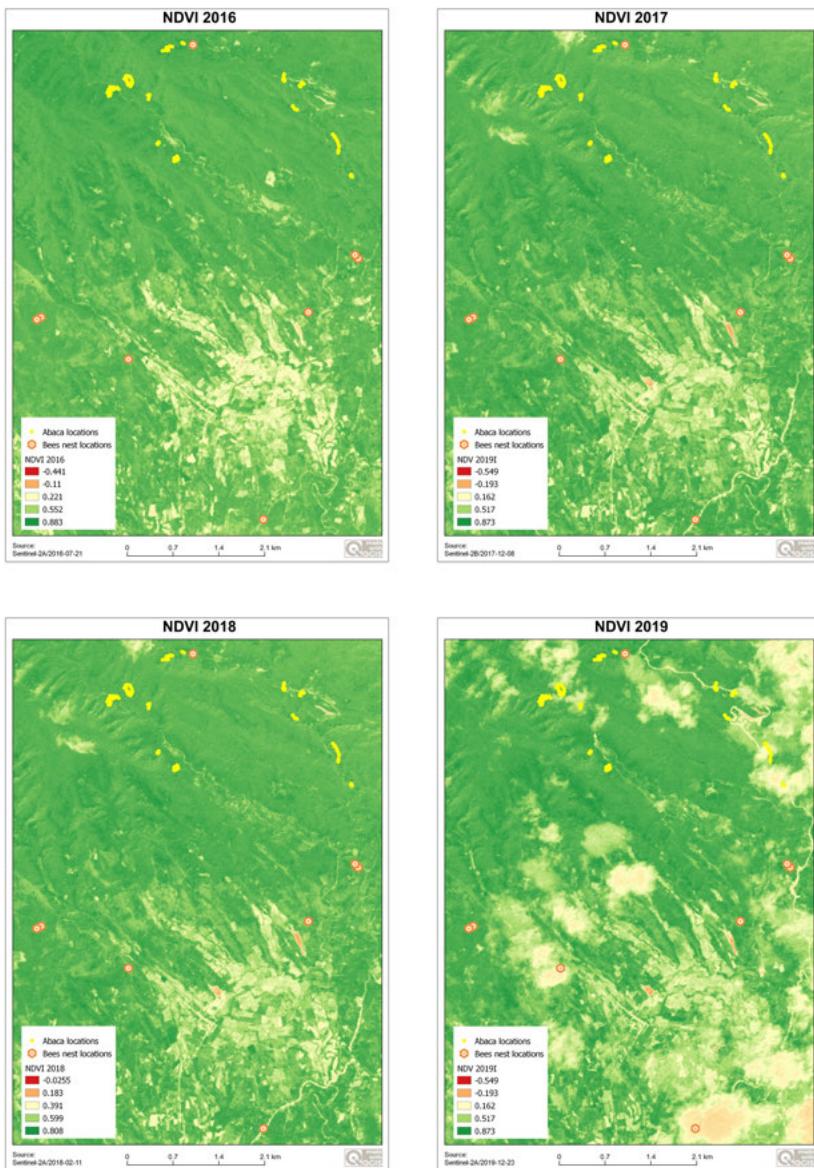
NDVI	2004	2016	2017	2018	2019
Minimum	-0.1	0.0936073	-0.117241	-0.0254958	-0.285448
Maximum	0.6	0.839036	0.832883	0.807531	0.854158

Through numerical and visual inspection (see Figure 5) of the NDVI for the past years, it can be seen that the community area has retained high NDVI values consistent with the characteristic high vegetation of tropical rainforests. This may be an indication that abacá harvesting and/or wild honey hunting do not negatively harm the community forests and are sustainable practices. Further analyses through mixed effects regression and repeated measures analysis of variance (ANOVA) (see Tables 2 to 4) using Stata 14.2 show that the high NDVI values in the Higaonon community forests as shown in Table 1 are statistically significant. This is highly relevant to forest conservation, showing that indigenous community-conserved areas such as those managed by AGMIHICU in Bukidnon could keep the forest cover high even with community forestry enterprises.



### Mapping the Value Chain of Abacá and Wild Honey CFEs

The value chains of the abacá and wild honey CFEs were mapped through key informant interviews and survey questionnaires. Looking at the two value chains (Figures 2 and 3), both enterprises have similar downstream actors and downstream value addition while having different upstream actors. In the abacá CFE, the upstream actors consist of the abacá harvesters and the abacá weavers and dyers. The abacá harvesters are responsible for gathering abacá plants in the forest and are usually the husbands of the abacá weavers. Due to abacá diseases such as bunchy top, there are instances when abacá plants are in short supply and abacá harvesters need to buy abacá plants from other harvesters. Abacá fibers that are gathered or bought are either given to the harvesters' wives, the Kalandang Weavers, for weaving or sometimes sold directly as fibers in the town market.



**FIGURE 5.** NDVI images of the area during the years 2016, 2017, 2018, and 2019. The year 2004 was not included due to a scan line corrector (SLC) failure of the satellite and the satellite image for 2019 includes cloud cover.

**TABLE 2.** Mixed effects regression analysis for honey

Mixed effects ML regression	Number of obs	40
Group variable: id	Number of groups	8
Obs per group		
	min	5
	avg	5.0
	max	5
		Wald chi2(4)
		117.32
Log likelihood	63.173783	Prob > chi2
		0.0000

NDVI	COEF.	STD. ERR.	Z	P> Z	[95% CONF. INTERVAL]
Year					
2016	.3820791	.0445463	8.58	0.000	.2947699 .4693883
2017	.3991212	.0528643	7.55	0.000	.2955091 .5027333
2018	.3725509	.0578537	6.44	0.000	.2591597 .4859421
2019	.2938173	.100241	2.93	0.003	.0973484 .4902861
_cons	.3128423	.0433953	7.21	0.000	.2277891 .3978955

**TABLE 3.** Repeated measures ANOVA for honey

Number of obs	40	R-squared	0.7160		
Root MSE	.125119	Adj R-squared	0.6044		
SOURCE	PARTIAL SS	DF	MS	F	PROB>F
MODEL	1.1051623	11	.1004693	6.42	0.0000
ID	.21464996	7	.03066428	1.96	0.0974
YEAR	.89051231	4	0.22262808	14.22	0.0000
RESIDUAL	.43833618	28	.01565486		
TOTAL	1.5434984	39	.03957688		

TABLE 3 (CONT'D)

Between-subjects error term	id					
Levels	8	(7 df)				
Lowest b.s.e. variable	id					
Repeated variable	year					
			Huynh-Feldt epsilon	=	0.4647	
			Greenhouse-Geisser epsilon	=	0.3806	
			Box's conservative epsilon	=	0.2500	

PROB > F						
SOURCE	DF	F	REGULAR	H-F	G-G	BOX
Year	4	14.22	0.0000	0.0006	0.0016	0.0070
Residual	28					

TABLE 4. Mixed effects regression analysis for abacá

Mixed-effects ML regression	Number of obs	500
Group variable: id	Number of groups	100
Obs per group		
	min	5
	avg	5.0
	max	5
Wald chi2(4)		787.72
Log likelihood	Prob > chi2	0.0000

NDVI	COEF.	STD. ERR.	Z	P> Z	[95% CONF. INTERVAL]
Year					
2016	.544449	.0217575	25.02	0.000	.5018051 .5870929
2017	.5162163	.0231488	22.30	0.000	.4708453 .5615872
2018	.500334	.0231793	21.59	0.000	.4549034 .5457646
2019	.4149599	.0287325	14.44	0.000	.3586452 .4712745
_cons	.2194147	.0218722	10.03	0.000	.176546 .2622834

**TABLE 5.** Repeated-measures ANOVA for abacá

Number of obs	500	R-squared	0.7724		
Root MSE	.128785	Adj R-squared	0.7132		
SOURCE	PARTIAL SS	DF	MS	F	PROB>F
<b>MODEL</b>	22.285654	103	.21636557	13.05	0.0000
<b>ID</b>	1.8309696	99	.01849464	1.12	0.2345
<b>YEAR</b>	20.454684	4	5.113671	308.32	0.0000
<b>RESIDUAL</b>	6.5678566	396	.0165855		
<b>TOTAL</b>	<b>28.85351</b>	<b>499</b>	<b>.05782267</b>		

Between-subjects error term

id

Levels

100 (99 df)

Lowest b.s.e. variable

id

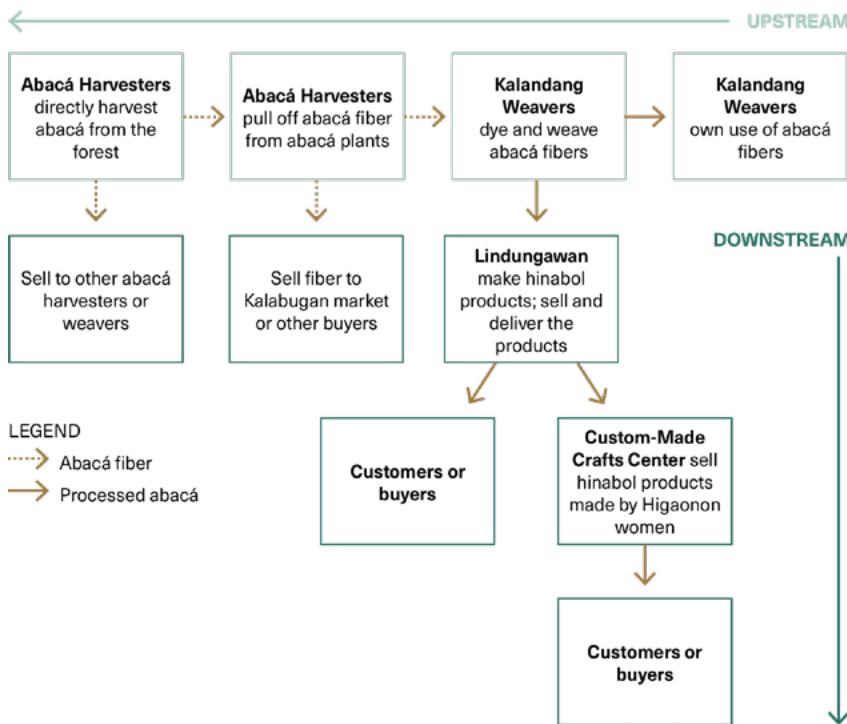
Repeated variable

year

Huynh-Feldt epsilon	=	0.4627
Greenhouse-Geisser epsilon	=	0.4547
Box's conservative epsilon	=	0.2500

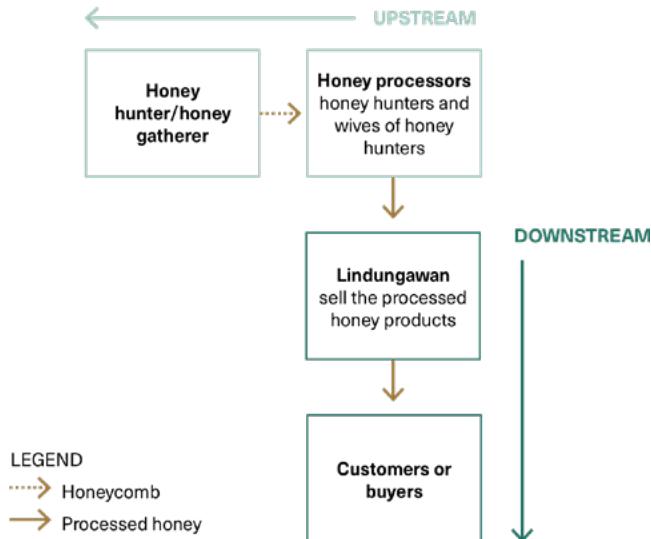
SOURCE	DF	F	PROB > F			
			REGULAR	H-F	G-G	BOX
year	4	308.32	0.0000	0.0000	0.0000	0.0000
Residual	396					

Abacá fibers given to the Kalandang Weavers are processed and woven to make hinabol products such as earrings, bags, and table mats, which are then delivered to Lindungawan's showroom in Malaybalay City, Bukidnon. Lindungawan is responsible for selling the hinabol products in Mindanao and delivering them to CMCC in Luzon.



**FIGURE 6.** Value chain map of abacá (*Musa textilis*). Abacá harvesters (upstream actors) sell raw materials to Kalandang weavers, who process the abacá and sell to downstream actors such as a local Bukidnon marketing initiative called Lindungawan, other retail buyers or direct customers.

In the wild honey CFE, the value chain is shorter than that of the abacá CFE. This, however, does not mean that there is less effort required in the wild honey CFE. Honey hunting and gathering also involves going to the forest and searching for giant honey bee hives and then climbing the trees to gather the honeycombs. As mentioned previously, only a select few have the skill and courage to do hunt giant honey bees and gather their honeycombs. Afterwards, the honey hunters and gatherers bring the honeycomb to the honey processors who are usually the wives of honey hunters. The honey processors drip filter the honeycomb in their tribal hall and then transfer the processed honey to a one-gallon container. The processed wild honey must first be blessed through a ritual before getting transferred to 250ml bottles provided by Lindungawan for retail selling.



**FIGURE 7.** Value chain map of wild forest honey gathered from giant honey bees (*Apis dorsata* F.)

Through key informant interviews, we were able to obtain production cost data of Class A abacá and honey, which include information on costs per value addition, labor, and other operating costs (Table 6). Class A hinabol are intricately woven, soft, and smooth with no sharp edges and bumps, and are of superior quality as they are thoroughly cleaned and ironed well. Class A honey has low moisture content, although this standard has been appropriated from the cavity-nesting bees (whose honeycombs are enclosed) such as the European honey bee and adjusted for open-nesting bees like the giant honey bees. Secondary data analysis of the farm gate prices of the two NTFPs show that raw abacá fiber and unprocessed honeycombs fetch the same price per kilo. Further along the value chain, there are marked differences between the production costs and the off-farm price, which is the farm gate price including transportation costs but excluding administrative costs.



Representation of giant honey bee, *Apis dorsata* F.

Looking at the off-farm price, wild honey considerably has a higher price than abacá. When calculating the profit margin, wild honey also has a higher profit with production costs and raw materials around 16 percent of the off-farm price compared to abacá, which has 33 percent of its off-farm price as production and raw material costs. From this rough approximation,

**TABLE 6.** Comparison of prices (in PHP) between abacá and honey NTFPs. To uphold confidentiality, the absolute figures given below are artificial numbers but provide close approximations of margins.

	ABACÁ	HONEY
Raw material per kilo (Class A)	50.00	50.00
Total production costs (Class A) (traditional design)	128.00	60.00
Processing	114.00	45.00
Operating cost	14.50	8.50
Resource management and cultural preservation fund	2.00	0.00
Off-farm price (per meter)	386.00	696.00 (per kilo)

which does not include administrative or fixed personnel costs, it seems that there is more profit to be had from gathering wild honey. However, as noted earlier, wild honey hunting is a seasonal occupation in its early stages within the AGMIHICU community compared to abacá harvesting. As an additional source of livelihood, wild honey hunting could be further explored given its potentials for bigger profit margins. Livelihood diversification through seasonal occupation like wild honey hunting could generate additional income and can spread environmental risk especially since abacá plants within the community are being affected by diseases (Hussein and Nelson 1998). In addition, having more forest products as source of livelihood could hold off land use change from agriculture (Delacote 2010). Given that wild honey hunting is in its early stages of enterprise development, this could also be an opportunity to develop into a sustainable and fair NTFP practice. Labor costs of the gatherers could be factored in gross margin analysis and prices recalculated to include these. Moreover, the wild honey enterprise so far has no allocation for the resource management and cultural preservation fund, unlike the abacá enterprise. With proper financial and technical support, the seasonal hunting of giant honey bees for wild honey could be further developed to contribute to increasing both the ethnocompetitiveness and livelihood security of the Higaonon people (Lugo-Morin 2017). When taken together, abacá and giant honey bees could constitute a diverse livelihood portfolio that could help in forest conservation.



## Concluding Remarks

As a social-ecological research endeavor, BEST Forests found that indigenous livelihoods in CFEs have complex and interconnected factors. The practices of abacá harvesting and wild honey hunting are derived from traditional livelihoods of the Higaonon community and have transitioned from subsistence to commercial livelihoods of the community. Both abacá and giant honey bees provide provisioning ecosystem services that support indigenous livelihoods, but the giant honey bee provides an additional regulating ecosystem service through its pollinating activity. However, having abacá and giant honey bees as sources of livelihood are better than having agricultural activities that stem from converting forests to agricultural areas.

There have been apprehensions about the harvesting and gathering of NTFPs and whether this may not contribute to deforestation per se, but instead to forest degradation. Spatial analysis conducted by BEST Forests show that the community forests of the Higaonon people maintained a high NDVI characteristic of tropical rainforests and may be an indication of sustainable harvesting of abacá and wild honey NTFPs. In terms of rural development, having diversified livelihoods may contribute to the ethnocompetitiveness of the Higaonon community and further developing the wild honey CFE may be a key factor.

Findings of BEST Forests show that despite the seasonality of the wild honey CFE, its profit margins are potentially bigger than that of abacá weaving. However, since there is no separate labor payment to the harvesters, it is difficult to assess whether the level of effort on abacá stripping and honey harvesting are commensurate to the gross margins. Once labor costs are factored in, there is a possibility that the gross margins could be smaller. One area where existing projects could further improve is ensuring that harvesters are also paid for their labor and not only for the products they harvest.



These results were made possible through a transdisciplinary research approach, which enabled close coordination throughout and continuous discourse after the project. BEST Forests shows how a transdisciplinary research approach is important in forest conservation research that involves forest-dependent peoples. The transdisciplinary approach ensured that the research goes beyond being a purely academic exercise and contributes to producing new integrated knowledge that could be a basis for future management actions in community forests.

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### References

- Abeto, R., J. Calilung, J. P. Talubo, and B. Cumatang. 2004. Community Mapping in the Philippines: A Case Study on the Ancestral Domain Claim of the Higaonons in Impasug-ong, Bukidnon. Philippine Association for Intercultural Development, Inc. (PAFID)-Central. Paper presented at the Regional Community Mapping Network Workshop, 8–10 November, Diliman, Quezon City.
- Adams, W. M., R. Aveling, D. Brockington, B. Dickson, J. Elliott, J. Hutton, D. Roe, B. Vira, and W. Wolmer. 2004. Biodiversity Conservation and The Eradication of Poverty. *Science* 306: 1146–1149.
- Angelstam, P., K. Anderson, M. Anerstedt, R. Axelsson, M. Elbakidze, P. Garrido, P. Grahn, K. I. Jönsson, S. Pedersen, P. Schlyter, E. Skärback, M. Smith, I. Stjernquist. 2013. Solving Problems in Social-Ecological Systems: Definition, Practice and Barriers of Transdisciplinary Research. *Ambio* 42: 254–265.
- Arnold, J. E. M. and M. R. Pérez. 2001. Can Non-Timber Forest Products Match Tropical Forest Conservation and Development Objectives? *Ecological Economics* 39 (3): 437–447.
- Balane, W. I. 2012. Higaonon Chieftain to be Feted for Forest Protection Works. *Mindanews*, 20 October, <https://www.mindanews.com/top-stories/2012/10/higaonon-chieftain-to-be-feted-for-forest-protection-works/>.

- Berkes, F. and C. Folke. 2002. Back to the Future: Ecosystem Dynamics and Local Knowledge. In *Panarchy: Understanding Transformations in Human and Natural Systems*, edited by L. H. Gunderson and C. S. Holling, 121–146. Washington: Island Press.
- Bolwig, S., S. Ponte, A. du Toit, L. Risgaard, and N. Halberg. 2008. Integrating Poverty, Gender, and Environmental Concerns into Value Chain Analysis: A Conceptual Framework and Lessons for Action Research. *Danish Institute for International Studies Working Paper* No. 2008/16.
- Brandt, P., A. Ernst, F. Gralla, C. Luederitz, D. J. Lang, J. Newig, F. Reinert, D. J. Abson, and H. von Wehrden. 2013. A Review of Transdisciplinary Research in Sustainability Science. *Ecological Economics* 92: 1–15.
- Cajetas-Saranza, R. 2016. Higaonon Oral Literature: A Cultural Heritage. *US-China Education Review* 6 (5): 302–310. <https://doi.org/10.17265/2161-6248/2016.05.003>.
- Crutzen, P. J. 2006. The "Anthropocene." In *Earth System Science in the Anthropocene*, edited by E. Ehlers and T. Krafft, 13–18. Berlin/Heidelberg: Springer.
- Delacote, P. 2010. Forest Products as Safety Net, Deforestation and the Tragedy of the Commons. *INRA Laboratoire d'Economie Forestière (LEF)* 2010-05.
- FAO (Food and Agriculture Organization of the United Nations). 2014. About Non-Wood Forest Products. FAO, 17 January. <http://www.fao.org/forestry/nwfp/6388/en/>.
- Garnett, S. T., J. Sayer, and J. du Toit. 2007. Improving the Effectiveness of Interventions to Balance Conservation and Development: A Conceptual Framework. *Ecology and Society* 12 (1): 2.
- Hirsch-Hadorn, G., D. Bradley, C. Pohl, S. Rist, and U. Wiesmann. 2006. Implications of Transdisciplinarity for Sustainability Research. *Ecological Economics* 60 (1): 119–128.
- Hughes, R. and F. Flintan. 2001. Integrating Conservation and Development Experience: A Review and Bibliography of the ICDP Literature. Issue paper, International Institute for Environment and Development.
- Hussein, K. and J. Nelson. 1998. Sustainable Livelihoods and Livelihood Diversification. Institute of Development Studies Working Paper No. 69. Poverty Research Unit, University of Sussex.
- IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services). 2016. Thematic Assessment of Pollinators, Pollination and Food Production. <http://www.ipbes.net/publication/thematic-assessment-pollinators-pollination-and-food-production>.
- ISOE (Institute for Social Ecological Research). 2020. Transdisciplinary Research. <https://www.isoe.de/en/research/transdisciplinary-research/>.
- Jahn, T., M. Bergmann, and F. Keil. 2012. Transdisciplinarity: Between Mainstreaming and Marginalization. *Ecological Economics* 79: 1–10.
- Jahn, T., D. Hummel, and E. Schramm. 2016. Sustainable Science in the Anthropocene. ISOE-Diskussionspapiere 40. Institute for Social-Ecological Research, Frankfurt.
- Kates, R. W., W. C. Clark, R. Corell, J. M. Hall, C. C. Jaeger, I. Lowe, J. J. McCarthy, H. J. Schellnuber, B. Bolin, N. M. Dickson, S. Faucheur, G. C. Gallopin, A. Grüber, B. Huntley, J. Jäger, N. S. Jodha, R. E. Kasperson, A. Mabogunje, P. Matson, H. Mooney, B. Moore III, T. O'Riordan, U. Svedlin. 2001. Sustainability Science. *Science* 292 (5517): 641–642.
- Lang, D. J., A. Wiek, M. Bergmann, M. Stauffacher, P. Martens, P. Moll, M. Swilling, and C. J. Thomas. 2012. Transdisciplinary Research in Sustainability Science: Practice, Principles, Challenges. *Sustainability Science* 7: 25–43.
- Lele, S., P. Wilshusen, D. Brockington, R. Seidler, and K. S. Bawa. 2010. Beyond Exclusion: Alternative Approaches to Biodiversity Conservation in the Developing Tropics. *Current Opinion Environmental Sustainability* 2: 94–100.
- Lugo-Morin, D. R. 2017. Ethnocompetitiveness, Relations, and Networks: Towards Rural Sustainability. *Development in Practice* 27 (7): 1020–1032.
- Matias, D. M. S., J. Leventon, A-L. Rau, H. von Wehrden, and C. Borgemeister. 2017a. A

- Review of Ecosystem Service Benefits from Wild Bees Across Social Contexts. *Ambio* 46 (4): 456–467.
- Matias, D. M. S., T. Stellmacher, C. Borgemeister, J. G. Cayron, and H. von Wehrden. 2017b. Mapping Giant Honey Bee Nests in Palawan, Philippines through a Transdisciplinary Approach. *Development in Practice* 27 (7): 903–912.
- Peters, C. M., A. H. Gentry, and R. O. Mendelsohn. 1989. Valuation of an Amazonian Rainforest. *Nature* 339: 655–656.
- Peña, P. 2010. NTFP and REDD at the Fourth World Conservation Congress: What is in and What is Not. *Conservation and Society* 8 (4): 292–297.
- Shackleton, C. M., T. Ticktin, and A. K. Pandey. 2015. Introduction: The Need to Understand the Ecological Sustainability of Non-Timber Forest Products Harvesting Systems. In *Ecological Sustainability for Non-Timber Forest Products: Dynamics and Case Studies of Harvesting*, edited by C. M. Shackleton, A. K. Pandey, and T. Ticktin, 3–11. Oxon/New York: Routledge.
- Shanley, P., A. R. Pierce, S. A. Laird, C. L. Binnquist, and M. R. Guariguata. 2015. From Lifelines to Livelihoods: Non-Timber Forest Products into the Twenty-First Century. In *Tropical Forestry Handbook*, edited by L. Pancel and M. Köhl, 1–50. Berlin/Heidelberg: Springer.
- Steffen, W., A. Persson, L. Deutsch, J. Zalasiewicz, M. Williams, K. Richardson, C. Crumley, P. Crutzen, C. Folke, L. Gordon, M. Molina, V. Ramanathan, J. Rockström, M. Scheffer, H. J. Schellnhuber, and U. Svedin. 2011. The Anthropocene: From Global Change to Planetary Stewardship. *Ambio* 40 (7): 739–761.
- Vidal, R. 2013. Uneasiness in Indigeneity: Paradoxical Ancestral Community Making in Northern Mindanao, the Philippines. MA thesis, Graduate School of Social Studies, University of Amsterdam, Netherlands.
- Weier, J. and D. Herring. 2000. Measuring Vegetation (NDVI & EVI). <https://earthobservatory.nasa.gov/features/MeasuringVegetation>. NASA Earth Observatory, 30 August.



# Exploring the Nexus Approach in Forest Conservation and Energy Access for Policy Integration and Coherence in the Philippines

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## Abstract

The forest conservation and energy access nexus, with climate change looming large in the horizon, is considered as one of the paramount concerns in the Anthropocene. The imperatives to adapt to and mitigate the changes spawned by the Anthropocene put pressure on legal systems to respond and adjust. This entails a more holistic examination of closely intertwined issues such as those arising from forest conservation and energy access to enhance coherence, support integrated approaches, and promote cross-sectoral collaboration.

Although many of the global challenges are interconnected, they tend to be addressed separately. This has resulted in what is described as “policy-and decision-making in silos,” which impedes the creation of an enabling environment for policy integration and coherence in otherwise interlinked sectors to the detriment of the most vulnerable and marginalized in society, especially the household as the basic social and consumption unit.

In the Philippines, the forest conservation and energy access nexus remains unexplored in the context of the country’s institutional, legal, and policy frameworks, which is reflected in the lack of research and literature looking into such linkages. Accordingly, this chapter introduces the nexus approach for the first time as an analytical and exploratory tool. It propounds that such an approach has the potential to uncover the gaps in the forest and energy policy environment and enhance integration and coherence to attain common or shared objectives. Increasingly, the nexus approach is recommended to analyze coherence of policy goals and instruments in order to achieve consistency across different sectors and institutions, especially against the backdrop of climate change that is often described as a defining challenge for present and future generations.

## Introduction

The forest conservation and energy access nexus, with climate change looming large in the horizon, is considered as one of the paramount concerns in the Anthropocene (Timko et al. 2018). The Anthropocene “signifies a period in geological time where humans are considered the dominant forces equalling the great forces of nature that catapulted the Earth into earlier geological epochs” (Kotze 2014). This triggers changes in the relationship between humans and the ecological, biological, and physical systems on the planet, as exemplified by climate change (Lazarus 2004), including irreversible loss of biodiversity (Biber 2017). In turn, the imperatives to adapt to and mitigate the changes spawned by the Anthropocene put pressure on legal systems to respond and adjust (Biber 2017). This entails a more holistic examination of closely intertwined issues such as those arising from forest conservation and energy access to enhance coherence, support integrated approaches, and promote cross-sectoral collaboration (Tidwell 2016).

Although many of the global challenges are interconnected, they tend to be addressed “singly, at times reducing one problem while exacerbating others,” that is, addressing one of the components may lead to “leakages” or “spillovers” that negatively impact other areas (Liu et al. 2020). For example, policymakers are often confronted with the difficult trade-offs between the competing demands for forest conservation and energy access, which are viewed and tackled historically as sectoral and separate institutional concerns. This has resulted in what Hoff describes as “policy- and decision-making in silos” (2011) that impedes the creation of an enabling environment for policy integration and coherence in otherwise interlinked sectors to the detriment of the most vulnerable and marginalized in society, especially the household as the basic social and consumption unit.

As the global energy demand soars, high fossil fuel prices and increasing greenhouse gas (GHG) emissions are prompting the search for alternative energy solutions such as biomass energy from wood by-products, among others. However, this could result in pressure on forests and lead to forest clearance, if not accompanied by clear, coherent, and well-enforced policies and regulations. As the Food and Agriculture Organization (FAO) Report on the State of the World’s Forest highlights, clear legal frameworks and coherent policy measures are integral to creating the enabling environment to strengthen “forest pathways to sustainable development” (2018). And yet, the forest conservation and energy access nexus remain unexplored in the context of the Philippine institutional, legal, and policy frameworks, which is reflected in the lack of research and literature looking into such linkages in the country.

This dearth in research and literature can be attributed, as mentioned earlier, to a fragmented approach separating forest and energy along sectoral and institutional lines spanning several decades. It is also perpetuated by laws

that essentially focus on the production and development of single resources, such as the 1970s era Presidential Decree (PD) No. 705 or Revised Forestry Code of the Philippines (which needs updating). Moreover, the situation is mirrored, for example, from the failure among various forest and energy actors to recognize the nexus, treating them as separate systems and ingraining a business-as-usual approach that effectively delinks both sectors. There are other plausible reasons for this significant gap in knowledge products that link forest conservation and energy access, the exploration of which is ripe for further studies.

In the above context, the chapter introduces the nexus approach for the first time as an analytical and exploratory tool. It propounds that such an approach has the potential to uncover the gaps in the forest and energy policy environment and enhance integration and coherence to attain common or shared objectives. Increasingly, the nexus approach is recommended to analyze coherence of policy goals and instruments in order to achieve consistency across different sectors and institutions (Papadopoulou et al. 2020), especially against the backdrop of climate change, which is often described as a defining challenge for present and future generations. Notably, the chapter is consistent with the Forest Foundation Philippines' knowledge and management goals to enrich academic inquiry, contribute to the literature, and promote an enabling environment for the sustainable management of the country's forests.

For purposes of the study, an iterative approach involving archival research, desktop reviews, and document analysis was undertaken. The research also relies on the review of available and relevant literature through data provided by pertinent government agencies, results of studies undertaken and/or commissioned by government agencies and international organizations, scholarly works, and information provided by other relevant stakeholder reports. Through the foregoing methodology and utilizing the nexus approach, the institutional, legal, and policy issues, as well as concerns and opportunities, in linking forest conservation and energy access are examined and contextualized in the Philippines. The options and pathways to enhance forest conservation and energy access policy integration and coherence are encapsulated in the concluding part of the chapter.



## The Nexus Approach

### Background

The Latin term *nexus* refers to identifying and establishing the “important connection between the parts of a system or group of things.” As a conceptual tool for analysis, the United Nations University first introduced this approach in its food-energy nexus programme in the 1980s. It is essentially premised on the proposition that interconnected and interdependent problems of access to food and fuel invites an integrated and comprehensive policy response (Silk and Sach 1991). It took a while before the nexus approach took hold in the international academic and policy spheres, until the Bonn 2011 Conference “Water, Energy and Food Security Nexus – Solutions for the Green Economy,” organized by the German Federal Government.

The Bonn 2011 Conference advanced the argument that the water, energy, and food nexus approach can result in improved water, energy, and food security by integrating “management and governance across sectors and scales,” reducing trade-offs, building synergies, and promoting sustainability and a transition to a green economy” (Hoff 2011, cited in UNU-FLORES n.d.). It is noted, however, that while there has been heightened interest in the nexus approach since then, there is no single universally recognized or accepted definition of the nexus approach in the international academic and policy arena. Instead, its concurrent definitions depend on motivation, usage, and context, “with partly overlapping, partly diverging foci” (UNU-FLORES n.d.). Therefore, there is a need to define the nexus approach in this research context.

While the nexus approach has positive features and an upswing in usage rate in the academic and policy arenas, Albrecht et al. argue that there is a need to delve deeper into the social and political dimensions beyond the typical economic and environmental management approaches (2018). In addition, there is still no empirical evidence to support the argument that the intended benefits (i.e., improved management and governance outcomes) arising from the nexus approach have been achieved (SEI 2018). Over time, however, the concern about outcome realization using the nexus approach can be addressed by populating the literature with success stories to buttress benefit claims. Also, it is suggested that the nexus approach can be improved by utilizing a more “nuanced methodological development”

and “by drawing from diverse knowledge bases and deeply engaging both stakeholders and decision-makers” (Albrecht et al. 2018). Hence, the nexus approach can be strengthened by drawing from promising approaches such as transdisciplinary, participatory, and social science approaches “to help align nexus research with policy needs and support its utilization in practice” (*ibid.*). Unfortunately, resource, time, and scope constraints limit the integration of other approaches in this research.

### The Nexus Approach: An Analytical Tool

Essentially, the nexus approach is borne out of the need to “reconcile long-term and global objectives” on “climate protection, eco-system stewardship and equity goals,” where interlinkages, interdependencies, and interactions abound (Hoff 2011). As mentioned earlier, the nexus among the water, energy, and food sectors, for example, is seen as providing the way to integrate and improve sectoral management and governance approaches and structures. The nexus approach is also employed to provide more comprehensive information and to better understand complex interactions across sectors to maximize synergies, optimize resource sustainability, and promote policy coherence (SEI 2018). Moreover, the nexus approach is expected to widen the scope of analysis, clarify interlinkages, and achieve improved outcomes through (but not limited to) governance and institutional and policy reforms, especially where interdependence among sectors exists. Furthermore, it seeks to analyze these sectors “as a single system to promote resource sustainability and effective governance,” which, in turn, enhances consistency and coherence (*ibid.*). Accordingly, the nexus approach is flexible enough to function “as an analytical tool, a conceptual framework, or a discourse,” which interestingly is a source of both its strength and weakness (Albrecht et al. 2018; SEI 2018).



### Forest Conservation and Energy Access: International Frameworks and Approaches

To understand the nexus between forest conservation and energy access in a broad sense, this part of the chapter canvasses and examines the various

international frameworks and approaches that establish the interrelationship and interdependence of forest conservation and energy access.

### **UN Framework Convention on Climate Change and the Paris Agreement**

The 1992 UN Framework Convention on Climate Change (UNFCCC) sets the global objective to stabilize “greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (4). It also recognizes that energy consumption in developing countries will grow to achieve sustainable social and economic development alongside the need to control the global increase in greenhouse gas (GHG) emissions (3). One of the actions needed to achieve this is the conservation and enhancement of GHG sinks and reservoirs, including the important role of forests, as both a carbon sink and a source of GHG emissions. This is articulated in Article 4.1(d) of the UNFCCC (5), which serves as the legal foundation for the development of land-based mitigation rules and activities spanning land use, land-use change, and forestry (LULUCF); reducing emissions from deforestation and forest degradation in developing countries; the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries (REDD+); and joint mitigation and adaptation approaches (La Viña and de Leon 2017). Specifically, REDD+ refers to a framework that has been negotiated under the UNFCCC to facilitate intergovernmental cooperation on forests and climate change. Forests are vitally important for achieving the goals of the Paris Agreement, and the REDD+ framework is therefore recognized in Article 5 of the Paris Agreement.

Moreover, the 1997 Kyoto Protocol included provisions on LULUCF activities, albeit tropical forests in developing countries were excluded from LULUCF considering that these countries do not have any legally binding mitigation targets under the Kyoto Protocol (La Viña and de Leon 2018).

The Paris Agreement’s Article 5 builds on Article 4.1(d) “and incorporates land-based mitigation and adaptation actions in a comprehensive way, zeroes in on the central role of forests, and creates opening for new approaches to such actions” (La Viña and de Leon 2017). This includes adopting an integrated management approach to land use and climate change to achieve interrelated and complementary objectives on forest conservation, energy access, and climate change mitigation. It also allows countries to undertake action “based on a holistic and multidimensional understanding of forests . . . placing equal or greater emphasis on social, environmental and governance aspects” (*ibid.*) —one that closely resonates in a nexus approach to forest conservation and energy access.

For purposes of complying with the Paris Agreement, the Philippines’ Intended Nationally Determined Contribution (INDC) seeks a 70 percent reduction of GHG emissions by 2030 from the business-as-usual scenario in energy, transport, forestry, industry, and waste sectors, albeit conditioned on the provision of the means of implementation that the country will receive in

the form of technical, capacity, and financial assistance. As the INDC indicates, energy and forestry are identified as key sectors in achieving national emission reduction and adaptation targets. The Philippine Climate Change Commission (CCC) created under RA No. 9729 as an independent, autonomous, policymaking and science-based body attached to the Office of the President is primarily tasked to coordinate, monitor, and evaluate programs and action plans of the Philippine government on climate change. The CCC is in the process of crafting and consolidating a Nationally Determined Contribution (NDC) that is supposed to be submitted to replace the INDC for purposes of complying with the 2015 Paris Agreement. It will be noted that pending submission of the NDC, the INDC's target of 70 percent reduction of GHG emissions by 2030 across sectors compared to a business-as-usual pathway, which according to experts is feasible (Verzola et al. 2017), will still stand (World Resources Institute n.d.). Undoubtedly, the Paris Agreement provides opportunities to achieve multiple objectives in the energy and forestry sectors to mitigate and adapt to climate change from a nexus perspective.



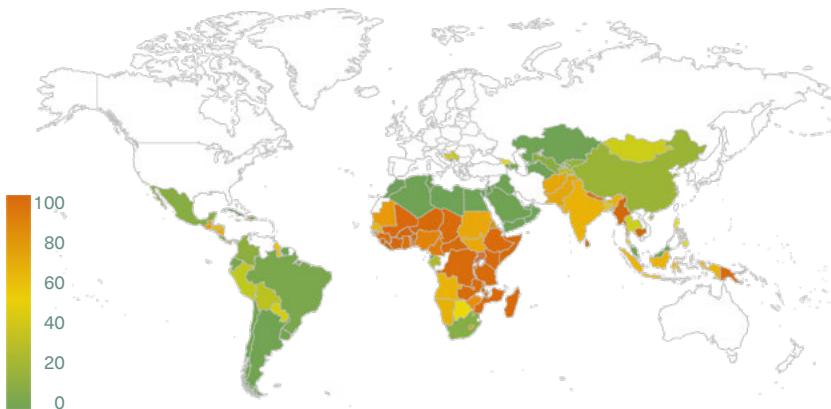
### **UN Sustainable Energy for All**

Access to modern energy services is indispensable to providing basic needs, eradicating poverty, and meeting sustainable development goals. This is because access to modern energy services affects a variety of critical outcomes involving “productivity, health, education, safe water and communication services” (Gaye 2007), among others. Yet close to a billion people remain without access to electricity and 2.8 billion people are still using traditional biomass fuels—wood, charcoal, crop residues, and animal dung—for their cooking needs, with deleterious health consequences (IEA 2017). By providing energy access, the poor are especially given the opportunity to move up the “energy ladder” from traditional biomass fuels to modern energy and reap its positive developmental, environmental, and health effects.

While the existing literature is replete with research on the water, energy, and food nexus, the nexus between forest conservation and energy access remains largely understudied. According to FAO, there is ample evidence that the sustainable management of forests contributes to achieving the UN Sustainable Development Goals (SDGs), including but not limited to poverty alleviation, access to modern energy services, and climate change mitigation (2018). In addition, forests supply close to 40 percent of global renewable energy, with around 2.4 billion people or about 500 million households reliant on woodfuel to provide basic energy services such as cooking food and sterilizing water (FAO 2018; see Map 1). In most cases, woodfuel is deemed

“the most affordable and reliable energy source, particularly for low-income populations of developing countries and for people affected by natural disasters and humanitarian crises.” (FAO 2018).

The widespread use of woodfuel, however, raises serious health concerns that are attributed to indoor or household air pollution from low-efficiency and high-smoke-emission traditional stoves, the most common of which is the so-called “three-stone fire.” Annually, the World Health Organization (WHO) estimates that 4.3 million people die prematurely from household air pollution due to woodfuel burning (2016). Aside from this health crisis, the reliance on traditional biomass for cooking has spawned gender inequities associated with fuelwood gathering, with women and children carrying the heaviest burden and being the most exposed to risk (*ibid.*).



MAP 1. Global Percentage of Households Relying on Woodfuel for Cooking (FAO 2018)

To improve the fuel properties of wood, there is widespread practice to convert wood into charcoal to slow the burning process and lessen the smoke released during combustion. Notably, “population growth, urbanization in developing countries (with associated changes in housing and habits) and the difference in its relative affordability compared with alternative energy sources” have contributed to increasing global charcoal consumption by approximately 20 percent in the past 10 years and almost doubled in the last 20 years (FAO 2017). This means that moving up the energy ladder (i.e., fuel switching from charcoal to cleaner and more efficient technologies) is a standing challenge (Van der Kroon et al. 2013). Van der Kroon et al. assert that there is a need to transition to cleaner and more efficient energy technologies “to overcome the negative effects of traditional energy on human health and the environment and to enhance the livelihood conditions of the poor” (*ibid.*). For example, Goldemberg and Lucon point out that increasing the efficiency of fuelwood for cooking, like using the ceramic *jiko* stove in East Africa, can help address deforestation (2010).

Where the demand for charcoal is relatively high, for example in Southeast Asia, “charcoal production adds pressure on forest resources and contributes to forest degradation and deforestation, especially when forest access is unregulated” (FAO 2018). In effect, a policy environment that is dominated by “open access” undermines forest conservation. Also, it is observed that “most charcoal production in developing countries uses simple technologies with a conversion efficiency of only 10–22 percent, compared to over 30 percent using more advanced technologies” (FAO 2017). Accordingly, a clear nexus exists between forest conservation and energy access: improved access to clean energy technologies can enhance forest conservation efforts.

While woodfuel makes an important contribution to energy access, especially for many of the world’s poor and people in vulnerable situations, it is critical to take steps to avoid the negative impacts on forest resources and compromise the delivery of other SDGs (FAO 2018), including taking effective climate action. To illustrate, it is estimated that fuelwood and charcoal production annually emit 1–2.4 gigatons of CO<sub>2</sub> equivalent to the atmosphere, which represent 2–7 percent of global anthropogenic emissions (FAO 2017). In effect, there is a need to assess the interlinkages, interdependencies, and co-benefits between forest conservation and energy access to develop sound legal framework and policy coherence that enhance cross-sectoral coordination, identify and address common barriers, and facilitate attainment of shared goals. The nexus approach is, therefore, a useful analytical tool to explore how policymakers can better align forest conservation and energy access objectives and policies for integration and coherence.

As mentioned earlier, over 4 million annual premature deaths are attributable to household and indoor air pollution from using traditional biomass fuels, “and several billion hours are spent collecting firewood for cooking, mostly by women, that could be put to more productive uses.” (IEA 2017) To elaborate, out of 850 million people engaged in fuelwood collection and charcoal production, close to 83 percent are women (FAO 2018). Evidently, the lack of access to clean cooking facilities—measured based on indoor air quality, cookstove efficiency, convenience, safety, affordability, quality, and availability of the primary fuel, per the globally accepted Multi-Tier Framework for tracking energy access (SEFA et al. 2019)—results in the further marginalization of the most vulnerable members of society in many developing countries.

Unfortunately, the twin deficits of lack of access to electricity and clean cooking facilities add another significant dimension to poverty called “energy poverty,” which refers to the “inability to cook with modern cooking fuels and the lack of a bare minimum of electric lighting to read or for other household and productive activities at sunset” (Gaye 2007). In its expanded version, energy poverty encompasses “lack of access to resources, denial of opportunities and choices in energy that is adequate, safe, and reliable for economic and human development” (UNDP 2011). Thus, overcoming energy poverty is of paramount

global and national concern. Conserving the forests is one of the keys that can unlock the prison of energy poverty, “as vital sources of income, livelihoods and well-being for rural populations, particularly indigenous people, smallholders, and those living in close proximity to forests” (FAO 2018).



### **UN Sustainable Development Goals**

The nexus between forest conservation and energy access is evident in the formulation of and achieving the SDGs, as the main global normative framework on environment and development until 2030 (Bastos Lima 2017). From recognised trade-offs, co-benefits and accepted coexistence, synergy between several policy domains can be progressed through common implementation frames, among others (Noordwijk 2018). The Energy Progress Report that globally tracks SDG 7, which calls for ensuring “access to affordable, reliable, sustainable and modern energy for all” by 2030, reveals that electricity access is up from 2017, with 89 percent of people around the globe already connected to some level of electricity (World Bank 2018). However, this translates to about 840 million people who still do not have access. Lagging furthest behind is access to clean cooking fuels and technologies, an area that has been typically overlooked by policymakers. This dimension of the energy access challenge has the strongest linkage to issues of forest conservation.

While wood has been used for millennia as fuel, particularly for heating and cooking (FAO 2011), the use of traditional cooking fuels and technologies among a large proportion of the world’s population, particularly in rural areas, has serious and widespread negative health, environmental, climate, and social impacts. Accordingly, the WWF Living Forests Report emphasizes that the challenges cannot be underestimated, and warns of approaches that are confused, fail to address leakage and especially impacts to other ecosystems, and create perverse incentives that inadvertently cause an unwanted result (2011).

Relevantly, SDG 13 articulates the need to take urgent action to combat climate change and “recognizes climate change as a wicked challenge that needs to be addressed in order to ensure sustainable development” (Vasseur et al. 2017). This goal is intricately linked to the UNFCCC and the Paris Agreement, which require the support of all countries due to the global scale and graveness of the problem. Tackling climate change as a sustainable development goal will require novel approaches based on the recognition that human, social, and natural systems are intricately interconnected (Cote and Nightingale 2012) and “to overcome the current challenges,

one must understand how to connect top-down national policies to . . . bottom-up development strategies” (Vasseur and Jones 2015). This requires acting locally and finding ways to encourage dialogue within and among government agencies, different levels of government (national-local), and other communities and stakeholders to come up with solutions relevant to their needs and conditions (Vasseur et al. 2017).

In addition, SDG 15 highlights, among others, the importance of managing the forests sustainably to achieve the SDGs, which include targets on eradicating poverty (SDG 1), access to sustainable energy (SDG 7) and climate action (SDG 13). Pertinently, the 2017 UN Strategic Plan for Forests incorporates specific associated targets such as coherent, coordinated, and complementary national and subnational forest-related policies and programs that engage relevant stakeholders. Moreover, the 2016 UN Forest Instrument articulates the need to strengthen legal and policy frameworks to enhance the contribution of forests to the attainment of the internationally agreed development goals, including the SDGs, particularly with respect to poverty eradication and environmental sustainability. Pertinently, a detailed study on the nexus between forest and poverty reveals that the poor draws close to 22 percent of their income from the forest (Rawlins et al. 2017).

Therefore, looking into interrelationships and interlinkages across sectors such as forestry and energy will enhance coherence, coordination, and complementarity of policies, programs, and implementation. As the Global Network on Energy for Sustainable Development (GNESD-UNEP) study emphasizes, “creative inter-linkages would ensure that the existing opportunities and infrastructure are tapped” to maximize co-benefits in the forest and energy sectors (2011). These interlinkages are echoed well in a nexus approach to forest conservation and energy access.



### Philippine Institutional, Legal, and Policy Framework: Issues and Concerns

While a close link and interdependency between forest conservation and energy access clearly exists in achieving the SDGs and global climate change objectives, there has been a lack of effective legal and policy frameworks that are in place to

promote forest conservation and energy access in conjunction with one another. This is largely attributable to a historically fragmented approach, wherein legislation and policies are developed along sectoral lines and institutional mandates, effectively isolating otherwise interconnected sectors into silos.

### **Institutional, Legal, and Policy Framework for Forest Conservation**

The forest has been treated as a separate natural resource sector in the Philippines since a Bureau of Forestry was created under the Department of Interior at the beginning of the American colonial period. From that time on until the new millennium, or for over a century, the same institutional setup of a forestry bureau under a national government agency is mirrored at various periods in history. The latest iteration of this institutional approach is reflected in Executive Order (EO) No. 192, s. 1987, which created the Department of Environment and Natural Resources (DENR) as the primary government agency responsible for the conservation, management, development, and proper use of the country's environment and natural resources such as forests and grazing lands. For purposes of accomplishing its mandate and as basis for policy formulation, the DENR is guided by the following objectives:

- (a) Assure the availability and sustainability of the country's natural resources through judicious use and systematic restoration or replacement, whenever possible;
- (b) Increase the productivity of natural resources in order to meet the demands for forest, mineral, and land resources of a growing population;
- (c) Enhance the contribution of natural resources for achieving national economic and social development;
- (d) Promote equitable access to natural resources by the different sectors of the population; and
- (e) Conserve specific terrestrial and marine areas representative of the Philippine natural and cultural heritage for present and future generations. (Section 4)

In addition, the DENR has the power, among others, to issue rules, policies, and regulations that encourage greater people participation and private initiative in natural resource management; harness forest resources in a sustainable manner; and assist rural development, including formulating an integrated, multisectoral, and multidisciplinary National Conservation Strategy or NCS (Section 5).

Under EO No. 192, the Forest Management Bureau (FMB) was also established as a staff sectoral bureau of the DENR with the primary responsibility of providing advice to the DENR Secretary "on matters pertaining to forest development and conservation" (Section 13). In particular, the FMB recommends policies and/or programs for the effective protection, development, occupancy, management, and conservation of forest lands

and watershed, among others. Through the FMB and its regional offices, the DENR implements PD No. 705, which remains as the main law governing the protection, development, management, regeneration, and reforestation of forest lands. This includes licensing and permitting for purposes of utilizing, exploiting, occupying, possessing, or conducting any activity within any forest land. The policy objectives of PD No. 705 include: (a) The multiple uses of forest lands shall be oriented to the development and progress requirements of the country, the advancement of science and technology, and the public welfare; b) Land classification and survey shall be systematized and hastened; c) The establishment of wood-processing plants shall be encouraged and rationalized; and d) The protection, development, and rehabilitation of forest lands shall be emphasized so as to ensure their continuity in productive condition (Section 2). While there have been several legislative attempts for the much-needed update to PD No. 705 (e.g., the proposed Sustainable Forest Management Bill in Congress) since the 1990s, this law has been serving as the country's primary legal and policy framework for forest development and conservation for the last 45 years.

In 1995, EO No. 263 was issued adopting Community-Based Forest Management (CBFM) as the national strategy for sustainable forestry and social justice with the DENR as the lead public agency. To implement EO No. 263, DENR Administrative Order No. 2004-29 provides the details of the CBFM concept, principles, process, and strategy, which is defined as one that aims to "improve the well-being of forest-dependent communities, and at the same time ensure the sustainable management, rehabilitation, and protection of the forestlands and the resources therein, through the active participation of different stakeholders." The CBFM strategy also provides a policy mechanism to recognize resource access and use rights through the issuance of long-term tenurial instruments, particularly the Community-Based Forest Management Agreement (CBFMA). Moreover, it assists participants to access investment capital and enhance market linkages (Aquino and Daquio 2014). However, CBFMA, as a tenure instrument, cannot be used as collateral to access bank financing for tree farm, agroforestry, or industrial tree plantations. Notably, the CBFMA's dominant objective remains tilted toward forest production, as seen in the Philippine Master Plan for Climate Resilient Forestry Development (PMPCRFD) (FMB-DENR 2016).

In 2004, EO No. 318 was issued promoting sustainable forest management in the Philippines. It declares as a matter of policy that watershed-based integrated ecosystems "shall be managed in a holistic, scientific, rights-based, technology-based and community-based manner and observing the principles of multiple-use, decentralization and devolution, and active participation of local government units (LGUs), synergism of economic, ecological, social and cultural objectives, and the rational utilization of all resources found therein" (Section 1). Among the guiding principles adopted include a holistic, sustainable, and integrated development of forestry resources; community-based forest

management as primary strategy in all forest conservation and development and related activities; and principles and practices of good governance such as transparency, accountability, and participatory decision-making in transactions, decisions, and actions affecting forestry, including partnerships and collaboration among different national government agencies, the local governments, local communities, and other stakeholders (Section 2).

The country updated its PMPCRFD in 2016, which was adopted in 2019 through the issuance of DENR Department Administrative Order (DAO) No. 2019-06. The PMPCRFD enunciates the need to climate-proof forestry development in the country considering: (a) the Philippine commitments under the UNFCCC; (b) the increasing global concern on the impacts of climate change to ecosystems and communities; (c) the call to integrate climate change adaptation in all programs and policies; and (d) the increasing recognition of the role of forests as providers of ecosystem goods and services, such as being a source of sustainable energy. Interestingly, one of the key strategic objectives enunciated in the PMPCRFD is the development and maintenance of 297,234 hectares of bioenergy and fuelwood plantations to support the National Renewable Energy Program, although the latter is focused more on power generation rather than energy access at the household level. Unfortunately, there is no express, specific reference to energy access in any of the laws and policies in the forestry sector, including in any programs on forest conservation, despite findings that it is a contributing factor to continued deforestation (Rawlins et al. 2017). Furthermore, there is neither one that precludes energy access, specifically the provision of clean cooking facilities; nor as part of the NCS or CBFM, especially if interlinked with forest conservation initiatives.

The sectoral approach in forestry has long been embedded and perpetuated in the institutional setup, but international and national commitments on sustainable development and climate action are driving legal and policy measures in the county to be more holistic, integrated, and consistent across the field—one that resonates in a nexus approach. This is evident in the forest policies and plans being issued in recent years incorporating climate resiliency and sustainable forest management principles that recognize the multifaceted role of the forest in providing ecosystem goods and services such as sustainable energy, among others.

To achieve the SDGs and global climate change goals, forest conservation and energy access policies must be interlinked and aligned to optimize the synergy and complementarity of such initiatives in attaining said goals. Clearly, an opportunity exists to incorporate access to clean cooking facilities into forest conservation policy instruments such as the NCS and the CBFM as a component of sustainable forestry and social justice, while contributing to the attainment of the SDGs and international climate change goals at the same time. To exemplify, an integrated, multisectoral and multidisciplinary NCS articulates a nexus approach that can serve as a platform to enhance policy coherence between forest conservation and energy access. Moreover, the

DENR has the broad powers to entertain co-implementation arrangements with the Department of Energy and other agencies through joint policy issuances to promote both forest conservation and energy access.



### **Institutional, Legal, and Policy Framework for Energy Access**

On the other hand, energy access, particularly through electrification or the provision of electricity services, falls within the remit of the Department of Energy (DOE). This mandate flows from Republic Act (RA) No. 7638 of 1992, which designated the DOE as the lead government agency tasked to “prepare, integrate, coordinate, supervise, and control all plans, programs, projects, and activities of the Government relative to energy exploration, development, utilization, distribution, and conservation.” The DOE functions include, but are not limited to: (a) Formulating “policies for the planning and implementation of a comprehensive program for the efficient supply and economical use of energy consistent with the approved national economic plan and with the policies on environmental protection and conservation and maintenance of ecological balance, and provide a mechanism for the integration, rationalization, and coordination of the various energy programs of the Government”; and (b) “Developing and updating the existing Philippine energy program which shall provide for an integrated and comprehensive exploration, development, utilization, distribution and conservation of energy resources, with preferential bias for environment-friendly, indigenous, and low-cost sources of energy” (Section 5).

Prior to the DOE Act, there is a very brief period when forestry and energy sector concerns were merged in a single institution. Under EO No. 131 s. 1987, a Department of Environment, Energy and Natural Resources was created integrating energy and natural resources functions under a single government agency. However, this was short-lived and eventually scrapped in favor of establishing an Office of Energy Affairs (OEA) per EO No. 193 s. 1987. The DOE succeeded the OEA and was also given the power to supervise the Philippine National Oil Company (resource development), National Power Corporation or NPC (power generation, transmission, and distribution) and the National Electrification Administration (regulation of electric cooperatives and rural electrification), as attached agencies and corporations. It will be noted that the institutional setup has an energy sector focus. Moreover, it provides the DOE with the opportunity to closely coordinate and supervise key public agencies involved in developing and implementing national policies and programs for the energy and electric power sector in an integrated, cohesive, and consistent manner.

RA No. 9136 or the Electric Power Industry Reform Act (EPIRA) of 2001 expanded the original mandate of the DoE not only to oversee the restructuring of the electric power industry, but also to undertake the formulation of policies toward “efficient supply and economical use of energy consistent . . . with the policies on environmental protection and conservation and maintenance of ecological balance.” An important EPIRA reform provision relevant to energy access, particularly electricity access, is the entry of qualified third parties into remote and unviable villages to provide electric service or participate in rural electrification, if a franchised utility is unable to do so for whatever reasons (Section 59). Missionary electrification or the delivery of basic electricity service to unviable areas remains a service domain of the NPC-Small Power Utilities Group (NPC-SPUG), in order to provide power and associated power delivery systems in areas that are not connected to the main transmission grid and cannot be serviced by distribution utilities or qualified third parties. NPC-SPUG generates power using diesel and bunker-fuelled generators (i.e., carbon-emission intensive), and notably admits that small islands and isolated grids are expensive to operate and maintain despite being heavily subsidized (Ahmed 2018).

The DOE essentially anchors its rural electrification programs on the DOE Act through Energy Regulation (ER) No. 1-94, Section 59 of the EPIRA, and other related administrative issuances such as Department Circular No. DC2006-04-0003 that created the Expanded Rural Electrification Program Team spearheaded by the DoE, together with its attached agencies and corporations and other line agencies. Under ER No. 1-94, power generators and/or energy resource developers are required to set aside one centavo per kilowatt-hour of the total electricity as financial benefits to host communities for electrification, development and livelihood, reforestation, watershed management, and health and/or environment enhancement. As mentioned earlier, Section 59 of the EPIRA opened opportunities for private sector participation and investment in the government’s rural electrification activities through the qualified third-party scheme. While rural electrification policies and programs abound through both public and private sector schemes, there is none when it comes to access to clean cooking facilities. Therefore, only the electricity access dimension is being addressed and access to clean cooking facilities remains to a large extent overlooked.

In 2016, it was noted that 61 million Filipinos still relied primarily on traditional use of biomass for cooking, as in 2015 (IEA 2017; See Table 1). Between 1992 to 2001, estimated average per capita consumption of fuelwood and charcoal in the Philippines ranged from 373 to 1,300 kg per capita per year in rural areas, and about 140 to about 700 kg per capita per year in urban areas (Remedio 2005). Over the years, fuelwood and charcoal consumption “has been notably highest in the household sector” compared to industrial end use (Remedio 2005, 137). However, there is a need to generate current data.

**TABLE 1.** Access to Modern Energy Services in Southeast Asia

ASEAN MEMBER COUNTRY	POPULATION WITHOUT ACCESS TO ELECTRICITY (2016)		POPULATION PRIMARILY RELYING ON TRADITIONAL USE OF BIOMASS (2015)	
	MILLION	SHARE (%)	MILLION	SHARE (%)
Brunei Darussalam	-	-	-	-
Cambodia	6	40%	13	83%
Indonesia	23	9%	67	26%
Lao PDR	<1	9%	7	96%
Malaysia	<1	1%	-	-
Myanmar	22	41%	51	94%
Philippines	11	10%	61	60%
Singapore	-	-	-	-
Thailand	-	-	18	26%
Vietnam	2	2%	36	39%
<b>Total</b>	<b>65</b>	<b>10%</b>	<b>252</b>	<b>40%</b>

Source: Data from IEA (2017)

It is also reported that woodfuel in the Philippines is mostly sourced from forest lands, protected areas, and mangroves, particularly brushlands and secondary forests, even though harvesting of fuelwood in natural forests is already prohibited (FMB–DENR 2016). To achieve climate resiliency, on the other hand, forestlands are largely expected to remain as major carbon sinks in the Anthropocene (ASOG and SSG Advisors 2016).

Where electrification strategies involve “microgrids and in combination with batteries, however, electricity may become an option for some cooking tasks, especially where rice is a food staple and efficient electric rice cookers can be used” (IRENA, OECD/IEA, and REN 21 2018). Distributed energy systems such as those sourced from renewables like biomass have been found to be ideal for remote, last mile, off-grid electrification, particularly of highly dispersed rural areas. For this purpose, RA No. 9513 or the Renewable Energy Act of 2008 (REA) is relevant in promoting the use of renewable energy technologies. Specifically, the REA declares the following as policy objectives:

- (a) Accelerate the exploration and development of renewable energy resources such as, but not limited to, biomass, solar, wind, hydro,

geothermal and ocean energy sources, including hybrid systems, to achieve energy self-reliance, through the adoption of sustainable energy development strategies to reduce the country's dependence on fossil fuels and thereby minimize the country's exposure to price fluctuations in the international markets, the effects of which spiral down to almost all sectors of the economy;

- (b) Increase the utilization of renewable energy by institutionalizing the development of national and local capabilities in the use of renewable energy systems, and promoting its efficient and cost-effective commercial application by providing fiscal and non-fiscal incentives;
- (c) Encourage the development and utilization of renewable energy resources as tools to effectively prevent or reduce harmful emissions and thereby balance the goals of economic growth and development with the protection of health and the environment; and
- (d) Establish the necessary infrastructure and mechanism to carry out the mandates specified in the RE Law and other existing laws (Section 2).

However, the REA mainly focuses on power generation and electricity access rather than access to clean cooking facilities, albeit providing fiscal incentives for renewable energy non-power applications such as fuel for cooking and renewable energy development in off-grid areas. It is not surprising that the DOE acknowledges explicitly that electrification is part of the energy sector agenda, but not necessarily including access to clean cooking facilities (DOE 2017). Although the DOE has neither considered forest conservation to be within its institutional domain nor as part of its mandate, the combined policy objectives of the DOE Act, EPIRA, and REA are broad enough to be construed as supportive of both the electricity and clean cooking facilities access dimensions, including achieving the SDGs and global climate change goals where forest conservation plays a major role. For example, access to clean cooking facilities can be reframed as part of the DOE's energy program that promotes environmental protection, forest conservation, and reduction of GHG emissions at the same time. Such a reframing is reasonable considering that the SDGs and climate-related policies dealing with the impacts of climate change strongly affect all nexus sectors such as forestry and energy. Finally, it is worth mentioning that "integration" has been a key functional mandate that the DOE is enjoined to pursue, which opens the window for policy coherence between forest conservation and energy access. Similar to the DENR, the DOE has the latitude to execute joint policy issuances and co-implementation arrangements with the former to achieve both forest conservation and energy access imperatives.



### The Palawan Approach

In 1992, RA No. 7611 or the Strategic Environmental Plan for Palawan (SEP) Act of 1992 (SEP Law) was enacted as a special law establishing a comprehensive framework for the sustainable development of Palawan that is compatible with protecting and enhancing the natural resources and endangered environment of the province. The SEP also serves as a guide to Palawan's local government and other concerned government agencies in the formulation and implementation of plans, programs, and projects affecting the province.

An interesting feature of the SEP is its underpinning philosophy that is grounded on ecological viability, social acceptability, and an integrated approach. First, *ecological viability* refers to the physical and biological cycles that maintain the productivity of natural ecosystems, which must always be kept intact. Second, *social acceptability* means that the people themselves, through a participatory process, are fully committed to support sustainable development activities by fostering equity in access to resources and the benefits derived from them. Third, an *integrated approach* is fostered that allows for a holistic view of problems and issues occurring in the environment, as well as opportunities for coordination and sharing that will eventually provide the resources and political will to implement and sustain SEP activities. This third feature echoes a strong a nexus approach.

Furthermore, the governance setup is well suited to interagency, public-private sector, and national-local government coordination through the Palawan Council for Sustainable Development (PCSD), which is under the Office of the President and consists of members of Congress from Palawan and representatives from the National Economic and Development Authority, the DENR, the Department of Agriculture, the Governor of Palawan, the Mayor of Puerto Princesa City, the President of the Mayor's League of Palawan, the President of the Provincial Chapter of the *Liga ng mga Barangay*, the Executive Director of the PCSD, and other members from the public or private sectors. This makes Palawan unique when it comes to legal and policy framework.

The SEP Law provides an interesting nexus model wherein interagency, national-local government, and multisectoral coordination and collaboration are built into the formulation and implementation of policies, plans, programs, and projects affecting Palawan. This means that the opportunity to link forest conservation and energy access objectives into a single, coherent policy can be realized by utilizing the Palawan SEP governance model. While the PCSD administers the implementation of the SEP Law, it essentially relies on coordination with other line agencies of the national government to enforce policies and regulations.

On the other hand, the SEP Law applies especially to the Province of Palawan and is not necessarily replicable anywhere else. This limits the scope of forest conservation and energy access policies and programs within Palawan. If replicated, it will take national legislation to be enacted to cover other parts of the Philippines, which involve a rigorous and cumbersome legislative process. However, as pointed out earlier, the SEP Law offers an opportunity to adopt an integrated and coherent approach to forest conservation and energy access within Palawan, particularly on access to clean cooking facilities, which considers the institutional, environmental, and social dimensions into the policy equation and program implementation.

### **Health as a Missing Link**

While there is a focus on forest conservation and energy access policy nexus in this chapter, it will not be remiss to highlight the gap related to the health impacts of the lack of access to clean cooking facilities and technologies. At the international level, WHO monitors the progress of expanding access to clean household energy for cooking as a global health problem. As articulated in EO No. 292, s. 1987 and EO No. 102, s. 1999, the Department of Health (DOH) is the lead public health agency in the Philippines and acts as a stakeholder, policy body, and regulator in the health sector. However, the DOH and the Philippine government as a whole do not have any policy or program on access to clean cooking facilities to address the health problem associated with the use of traditional biomass for cooking. Alarmingly, as SEFA et al. note, “the Philippines does not have any clean cooking policy in place” (2019), and neither is there a national target nor an identified institutional and regulatory entity tasked to generate such a policy. Therefore, it is a troubling policy gap in the Philippines that must be filled considering the magnitude and complexity of the challenge.



### **Conclusion and Moving Forward**

Considering the significant degree of interlinkage between forest conservation and energy access, particularly access to clean cooking facilities, in terms of achieving the SDGs and global climate change goals,

policymakers should alternatively focus on taking a more comprehensive and integrated approach to the effective management and implementation of both. This would require policymakers to consider innovative policies and approaches that enhance alignment, interaction, co-benefit, and joint implementation of forest conservation and energy access as part of a single system, per the nexus approach. By bringing together institutions, for example, involved in different sectors, “nexus approaches can promote cooperation, coordination and policy coherence” (Liu et al. 2018).

This chapter has been exploratory, primarily in terms of employing the nexus approach to investigate the gaps and opportunities for policy integration and coherence insofar as forest conservation and energy access in the Philippines are concerned. As a result of the nexus analysis, it is revealed that the current institutional, legal, and policy framework in the country is designed along sectoral lines that situates forest conservation and energy access in silos. While this is historically the case, international and national development commitments and trends as exemplified by the SDGs and global climate change goals are driving policies to be more integrated and coherent across sectors to attain common or shared objectives (FMB–DENR 2016). A significant policy gap has also been identified, considering that there is no existing national and local policy in the Philippines addressing the lack of access to clean cooking facilities and technologies as an important component to achieve the SDGs and global climate change goals, especially in view of the negative health impacts of the continued use of traditional biomass such as fuelwood and charcoal for cooking.

Moving forward, the nexus approach highlights the need for policy integration and coherence to fill gaps and redouble efforts to enhance energy access, particularly in rural areas, while achieving forest conservation at the same time in the Philippines. However, this is easier said than done. As it is, allocating the significant costs associated with building the required infrastructure and supply chain to serve the more rural, remote, and less-populated areas will be complex and difficult. Overcoming the challenge of providing access to clean cooking facilities will likewise require significant investments. It is projected that USD 523 million in finance will be required, of which USD 220 million will be utilized to address the affordability gap (SEFA et al. 2019).

As mentioned earlier, there is a need to overcome the legislative inertia and update PD No. 705 for the sustainable management of the country’s forest in line with sustainable development and climate change goals. Pending this, the CBFM as an existing policy instrument articulates core objectives to deliver sustainable forestry and social justice. Considering that fuelwood and charcoal use continue to pose concerns in sustainably managing the forest, CBFM inherently carries features for integrating forest conservation and energy access objectives. To illustrate, planting the right fuelwood species in a CBFM area provides a sustainable source for woodfuel and charcoal to

address, among others, the wood gathering and collection burden that women and children bear. Incorporating a component to provide clean cooking facilities and technologies, such as more fuel efficient and eco-friendly stoves that are locally available and proven to reduce GHG emissions and household air pollution, will also enhance forest conservation efforts.

Moreover, this strategy can evolve into a transition approach to fuel-switching and moving up the energy ladder, although recent research points to “fuel stacking” as the likely reality of how households use energy at home (WHO, 2016). While the DENR remains as the lead implementing agency for the CBFM, other government agencies such as the DOE and DOH are suitable partners for an enhanced CBFM program with cross-sectoral and socioeconomic components that achieve energy access and health targets in conjunction with forest conservation objectives. Pertinently, a redesign of an enhanced CBFM policy will benefit from participatory processes through adequate consultation and analysis of environmental, social, and economic impacts in the context of specific national and local conditions.

Furthermore, the National Conservation Strategy or NCS presents an opportunity for policy integration and coherence considering the multisectoral and multidisciplinary approach to its formulation. Although the DENR is the main government agency tasked to formulate the NCS, it offers several opportunities for participation, consultation, and contribution from other government entities and sectors. There is currently no consolidated NCS that has the potential to overcome policymaking in silos and incorporate forest conservation and energy access, as key components, together. It is timely to revisit this institutional deliverable under EO No. 192.



From an electrification standpoint, the Philippines has active and ongoing programs for last mile rural electrification with support from multilateral and bilateral development partners, including through public, private, and public-private sector schemes. To achieve the country’s total electrification target, off-grid households in remote areas must be reached. Due to the geographic and highly dispersed nature of these households, stand-alone distributed energy systems and mini-grids are being considered as viable and cost-effective solutions for off-grid electrification for the remaining 11 million Filipinos still without electricity. By exploring thematic synergies and complementarities on forest conservation, energy access (clean cooking technologies), and health to attain the SDGs and global climate change goals, rural electrification approaches can incorporate strategies on forest conservation, introduce clean cooking technologies, and address household

air pollution as deliverable components. This will entail close interagency coordination and collaboration among the DOE, DENR, and DOH, as well as their respective development partners, including pooling resources and putting in place administrative arrangements for the interagency partnership.

Lastly, the Nationally Determined Contribution (NDC) calls for inputs from the energy and forest sectors to deliver on the commitments under the UNFCCC and the Paris Agreement. These include mitigation and adaptation targets to limit global warming to under 2°C, as provided in the Paris Agreement. While the existing Philippine INDC of 70 percent GHG reduction by 2030 from the business-as-usual scenario is conditional, it is a feasible target in which forest conservation and energy access can contribute together, as interlinked sectors. However, the current policies that are in place do not meet the target articulated in the INDC, though it is still undergoing revision for purposes of the NDC (Climate Action Tracker n.d.). Therefore, the NDC has the potential to explore the linkage between forest and energy deeper to deliver a Paris Agreement-compliant country instrument.



### Future Research Directions

The nexus issues on forest conservation and energy access are multidimensional, complex, and extensive. This means that opportunities to extend the research abound. To reiterate, this chapter is essentially exploratory and examines the Philippine institutional, legal, and policy framework on forest conservation and energy access for integration and coherence based on a novel approach. However, the study recognises that it can cover only so much and acknowledges the limited time and data available to delve deeper into the nexus between forest conservation and energy access in the Philippines. For this purpose, a couple of future research directions emerge initially.

In view of the gender and equity dimension of the issue on lack of access to clean cooking facilities and technologies vis-à-vis forest conservation, there is a need to generate data to support an empirical and evidence-based approach to crafting relevant and appropriate policies for forest conservation and energy access in the Philippines. Notably, forest conservation and energy access are relatively

site-specific, and the context varies from one landscape to another. Bearing in mind the Forest Foundation's focal landscapes in Palawan, Sierra Madre, Samar and Leyte, and Bukidnon and Misamis Oriental, site-specific studies on gender, demographics, and household energy consumption are encouraged in these areas.

Along this line, accounting for GHG emissions and reductions from forest conservation and energy access, particularly net emissions from woodfuel, remain unknown if the contribution to climate change mitigation is to be quantified. This is important in determining the baseline and progress if mitigation targets in forest conservation and energy access are to be jointly set, measured, monitored, and evaluated. To better understand this aspect, a study to establish an emission and reduction profile for the focal landscapes relevant to forest conservation and energy access is recommended, which can also inform emerging REDD+ initiatives on climate change mitigation.

To emphasize, the proposed nexus approach to forest conservation and energy access is a novelty and does not purport to hold the answer to every question that may arise regarding the matter. For this reason, the ideas and propositions presented in the chapter would undeniably be enriched and refined by extending the research, especially into those areas where the literature remains absent or limited.

### Final Reflection

The options and pathways identified above are meant to trigger continuing conversations on the issue of energy access, particularly the lack of access to clean cooking facilities and technologies, as it relates to forest conservation. The scope, however, can easily extend beyond forest conservation and energy access considering broader long-term sustainable development and climate change goals. By having those conversations, designing relevant and appropriate policies can benefit from a nexus approach in tackling the forest conservation and energy access challenge in the Philippines, as integrated and coherent rather than separate sectoral and institutional concerns.

## Notes

1. The International Energy Agency defines energy access as “a household having reliable and affordable access to both clean cooking facilities and to electricity, which is enough to supply a basic bundle of energy services initially, and then an increasing level of electricity over time to reach the regional average.” From this definition, there are two elements of energy access at the household level: electricity access and access to clean cooking facilities. Electricity access entails a household having initial access to sufficient electricity to power a basic bundle of energy services—at a minimum, several lightbulbs, phone charging, a radio, and potentially a fan or television—with the level of service capable of growing over time. On the other hand, access to clean cooking facilities means access to (and primary use of) modern fuels and technologies, including natural gas, liquefied petroleum gas (LPG), electricity, and biogas, or improved biomass cookstoves (ICS) that have considerably lower emissions and higher efficiencies than traditional three-stone fires for cooking (IEA 2020).
2. *Cambridge Advanced Learner’s Dictionary and Thesaurus*, s.v. “nexus (n.),” <https://dictionary.cambridge.org/dictionary/english/nexus>.
3. The energy ladder refers to the phenomenon of households and firms—and so, in aggregate, countries—shifting from low-efficiency fuels to high-efficiency ones as income per capita increases (World Bank 2008).
4. According to IRENA (2017), the concept of electrification is two-fold: (a) providing the infrastructure (i.e., line extension, that would allow potential consumers to gain access to the source of electricity); and (b) actual delivery of electricity to households.
5. “Unviable areas” refer to a geographical area within the Franchise Area of a Distribution Utility where immediate extension of distribution line is not feasible.

## References

- Ackom, E., M. B. Pedersen, and J. M. Christensen. 2011. Bioenergy: The Potential for Rural Development and Poverty Alleviation: Summary for Policy-Makers. The Global Network on Energy for Sustainable Development (GNESD).
- Ahmed, S. 2018. Electricity in the Philippines Does Not Need to Be So Expensive—or Dirty. *Eco-Business*, 16 May. <https://www.eco-business.com/opinion/electricity-in-the-philippines-does-not-need-to-be-so-expensiveor-dirty/>.
- Albrecht, T. R., A. Crootof, and C. A. Scott. 2018. The Water-Energy-Food Nexus: A Systematic Review of Methods for Nexus Assessment. *Environ. Res. Lett.* 13 (043002). <https://iopscience.iop.org/article/10.1088/1748-9326/aaa9c6/pdf>.
- Aquino, A. and C. R. Daquio. 2014. *CBFM: A National Strategy for Sustainable Forest Management*. Food and Fertilizer Technology Center for the Asian and Pacific Region (FFTC-AP). [http://ap.fftc.agnet.org/ap\\_db.php?id=280&print=1](http://ap.fftc.agnet.org/ap_db.php?id=280&print=1)
- ASOG (Ateneo de Manila University School of Government) and SSG Advisors. 2016. Getting Our Acts Together. <http://www.ateneo.edu/aps/asog/goat>.
- Bastos Lima, M. G., G. Kissinger, I. J. Visseren-Hamakers, J. Braña-Varela, and A. Gupta. 2017. The Sustainable Development Goals and REDD+: Assessing Institutional Interactions and the Pursuit of Synergies. *International Environmental Agreements: Politics, Law and Economics* 17: 589–606. <https://doi.org/10.1007/s10784-017-9366-9>.
- Biber, E. 2017. Law in the Anthropocene Epoch. *Georgetown Law Journal* 106 (1): 1–68. <https://georgetownlawjournal.org/articles/247/law-anthropocene-epoch/pdf>.
- Buitre, M. J. C., H. Zhang, and H. Lin. 2019. The Mangrove Forests Change and Impacts from Tropical Cyclones in the Philippines Using Time Series Satellite Imagery. *Remote Sens* 11 (6): 1–15.
- Climate Action Tracker. n.d. Philippines. <https://climateactiontracker.org/countries/philippines/>.

- Cote, M. and A. J. Nightingale. 2012. Resilience Thinking Meets Social Theory: Situating Social Change in Socio-Ecological Systems (SES) Research. *Progress in Human Geography* 36 (4): 475–489. <https://doi.org/10.1177/0309132511425708>.
- DOE (Department of Energy). 2017. Energy Annual Report. <https://www.doe.gov/ph/pep-energy-annual-report-2017>.
- FAO (Food and Agriculture Organization of the United Nations). 2011. *State of the World's Forests*. Rome: FAO. <http://www.fao.org/3/i2000e/i2000e.pdf>.
- . 2017. *The Charcoal Transition: Greening the Charcoal Value Chain to Mitigate Climate Change and Improve Local Livelihoods*, prepared by J. van Dam. Rome: FAO. <http://www.fao.org/3/a-i6935e.pdf>.
- . 2018. *State of the World's Forests*. Rome: FAO. <https://reliefweb.int/sites/reliefweb.int/files/resources/19535EN.pdf>.
- FMB-DENR (Forest Management Bureau of the Department of Environment and Natural Resources). 2016. Philippine Masterplan for Climate Resilient Forestry Development. [http://forestry.denr.gov.ph/pdf/mp/PMPCRFD\\_2015\\_plus\\_Annexes.pdf](http://forestry.denr.gov.ph/pdf/mp/PMPCRFD_2015_plus_Annexes.pdf).
- Garcia, K. B., P. L. Malabriga Jr., and D. T. Gevaña. 2014. Philippines' Mangrove Ecosystem: Status, Threats, and Conservation. In *Mangrove Ecosystems of Asia*, edited by I. Faridah-Hanum, A. Latiff, K. Hakeem, and M. Ozturk. New York: Springer. [https://doi.org/10.1007/978-1-4614-8582-7\\_5](https://doi.org/10.1007/978-1-4614-8582-7_5).
- Gaye, Amie. 2007. Access to Energy and Human Development. Human Development Report 2007/2008. <http://hdr.undp.org/en/content/access-energy-and-human-development>.
- Goldemberg, J. and O. Lucon. 2010. *Energy, Environment and Development*. London: Earthscan.
- Hoff, H. 2011. Understanding the Nexus. Background Paper for the Bonn 2011 Conference: The Water, Energy and Food Security Nexus. Stockholm Environment Institute. [https://www.water-energy-food.org/uploads/media/understanding\\_the\\_nexus.pdf](https://www.water-energy-food.org/uploads/media/understanding_the_nexus.pdf)
- IEA (International Energy Agency). 2017. Southeast Asia Energy Outlook. <https://www.iea.org/reports/southeast-asia-energy-outlook-2017>.
- . 2020. Defining Energy Access: 2020 Methodology. 20 October. <https://www.iea.org/articles/defining-energy-access-2020-methodology>.
- IRENA (International Renewable Energy Agency). 2017. Accelerating Renewable Mini-Grid Deployment: A Study on the Philippines. <https://www.irena.org/publications/2017/Oct/Accelerating-renewable-minigrid-deployment-in-the-Philippines>.
- IRENA, OECD (Organisation for Economic Co-operation and Development)/IEA, and REN 21 (Renewable Energy Policy Network for the 21st Century). 2018. Renewable Energy Policies in a Time of Transition. <https://www.irena.org/publications/2018/Apr/Renewable-energy-policies-in-a-time-of-transition>.
- International Institute for Applied Systems Analysis. 2012. *Global Energy Assessment: Towards a Sustainable Future*, Cambridge, UK: Cambridge University Press.
- Kotze, L. 2014. Human Rights and the Environment in the Anthropocene. *The Anthropocene Review* 1 (3): 252–275. <https://doi.org/10.1177/2053019614547741>.
- Lazarus, R. 2004. *The Making of Environmental Law*. Chicago: University of Chicago Press.
- La Viña, A. and A. de Leon. 2017. Conserving and Enhancing Sinks and Reservoirs of Greenhouse Gases, including Forests (Article 5). In *The Paris Agreement and Climate Change*, edited by K. Daniel, M. P. Carazo, M. Doelle, J. Bulmer, and A. Higham. Oxford: Oxford University Press.
- . 2018. From Bali to Paris: The Global Regime on Climate and Tropical Forests and Its Implications on the Philippines. *Ateneo Law Journal* 62 (3): 703–727.
- Office of the President of the Philippines. s. 1987. Executive Order No. 192. *Official Gazette*. <https://www.officialgazette.gov.ph/1987/06/10/executive-order-no-192-s-1987/>.
- . s. 1975. Presidential Decree No. 705. *Official Gazette*. <https://www.officialgazette.gov.ph/1975/05/19/presidential-decree-no-705-s-1975/>.
- . s. 2004. Executive Order No. 318. *Official Gazette*. <https://www.officialgazette.gov.ph/2004/06/09/executive-order-no-318-s-2004/>

- Palawan Council for Sustainable Development. 2015. State of the Environment of Palawan 2015 Updates. <https://www.pkp.pcsd.gov.ph/images/redSOE2015.pdf>.
- Papadopoulou, C. A., M. P. Papadopoulou, C. Laspidou, S. Munaretto, and F. Brouwer. 2020. Towards a Low-Carbon Economy: A Nexus-Oriented Policy Coherence Analysis in Greece. *Sustainability* 12 (1): 373. <https://doi.org/10.3390/su12010373>.
- Rawlins, M. A., L. F. Aggabao, A. Araza, M. Calderon, J. Elomina, G. B. Ignacio, and E. Soyosa. 2017. *Understanding the Role of Forests in Supporting Livelihoods and Climate Resilience: Case Studies in the Philippines*. Manila: World Bank.
- Remedio, E. M. 2005. An Analysis of Sustainable Fuelwood and Charcoal Production in the Philippines: A Case Study. <http://www.fao.org/3/i1321e/i1321e08.pdf>
- Silk, D. and I. Sach. 1991. Food and Energy: Strategies for Sustainable Development. United Nations University Press. [#1%20Introduction](http://archive.unu.edu/unupress/unupbooks/80757e/80757E01.htm)
- SEI (Stockholm Environment Institute). 2018. *Where is the Value? A Review of the Water-Energy-Food Nexus Literature*. <https://www.sei.org/wp-content/uploads/2018/07/review-of-the-water-energy-food-nexus.pdf>.
- Sustainable Energy for All, E3 Analytics, and Catalyst. 2019. *Energizing Finance: Taking the Pulse*. <https://www.seforall.org/sites/default/files/2019-11/EF-2019-TP-SEforALL-w.pdf>
- Tidwell, Thomas. 2016. Nexus between Food, Energy, Water, and Forest Ecosystems in the USA. 2016. *Journal of Environmental Studies and Sciences* 6: 214–224.
- Timko, J., P. Le Billon, H. Zerriffi, J. Honey-Rosés, I. la Roche, C. Gaston, T. CH. Sunderland, and R. A. Kozak. 2018. A Policy Nexus Approach to Forests and the SDGs: Tradeoffs and Synergies. *Current Opinion in Environmental Sustainability* 34: 7–12. <https://doi.org/10.1016/j.cosust.2018.06.004>.
- UNDP (United Nations Development Programme). 2011. *Towards an 'Energy Plus' Approach for the Poor: A Review of Good Practices and Lessons Learned from Asia and the Pacific*. [https://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable\\_energy/towards\\_an\\_energyplusapproachforthepoorareviewofgoodpracticesand.html](https://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable_energy/towards_an_energyplusapproachforthepoorareviewofgoodpracticesand.html).
- UNFCCC (UN Framework Convention on Climate Change). 2012. Convention Text. 21 March. <https://unfccc.int/process-and-meetings/the-convention/what-is-the-united-nations-framework-convention-on-climate-change>.
- . 2015. Paris Agreement. 21 December. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- UNU-FLORES (United Nations University Institute for Integrated Management of Material Fluxes and Resources). n.d. The Nexus Approach. <https://flores.unu.edu/en/research/nexus>.
- Van der Kroon, B., R. Brouwer, P. J. H. van Beukering. 2013. The Energy Ladder: Theoretical Myth or Empirical Truth? Results from a Meta-Analysis. *Renewable and Sustainable Energy Review* 20: 504–513. <https://doi.org/10.1016/j.rser.2012.11.045>.
- Van Noordwijk, M., L. A. Duguma, S. Dewi, B. Leimona, D. C. Catacutan, B. Lusiana, I. Öborn, K. Hairiah, and P. A. Minang. 2018. SDG Synergy between Agriculture and Forestry in the Food, Energy, Water and Income Nexus: Reinventing Agroforestry. *Current Opinion in Environmental Sustainability* 34: 33–42. <https://doi.org/10.1016/j.cosust.2018.09.003>.
- Vasseur, L., D. Horning, M. Thornbush, E. Cohen-Shacham, A. Andrade, E. Barrow, S. R. Edwards, P. Wit, and M. Jones. 2017. Complex Problems and Unchallenged Solutions: Bringing Ecosystem Governance to the Forefront of the UN Sustainable Development Goals. *Ambio* 46: 731–742.
- Vasseur, L., and M. Jones. 2015. Adaptation and Resilience in the Face of Climate Change: Protecting the Conditions of Emergence through Good Governance. GSDR Brief, United Nations. <https://sustainabledevelopment.un.org/content/documents/6579124-Vasseur-Adaptation%20and%20resilience%20in%20the%20face%20of%20climate%20change.pdf>.

- Verzola, R., J. Logarta, and P. Maniego. 2017. Towards a Just Transition in the Philippine Electricity Sector. Pasig: Friedrich Ebert Stiftung.
- WHO. 2016. *Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and Wellbeing of Women and Children*. Geneva: World Health Organization. <https://www.who.int/airpollution/publications/burning-opportunities/en>.
- World Bank. 2008. The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits. <https://openknowledge.worldbank.org/handle/10986/6519>.
- . 2018. Tracking SDG7: The Energy Progress Report 2018. <https://openknowledge.worldbank.org/handle/10986/29812>.
- World Resources Institute. n.d. "What is an INDC?" <https://www.wri.org/indc-definition>.
- WWF (World Wildlife Fund). 2011. WWF Living Forests Report. [http://awsassets.panda.org/downloads/lfr\\_chapter\\_2\\_final.pdf](http://awsassets.panda.org/downloads/lfr_chapter_2_final.pdf)



# Examining Sustainability Issues in the Water- Dependent Economy of Downstream Sectors in the Cagayan de Oro River Basin

Catherine Roween C. Almaden, PhD

## Abstract

Interrelated sustainability issues are examined in the case of the downstream water users in the Cagayan de Oro River Basin (CDORB), specifically Cagayan de Oro City (CDOC). The analysis focuses not only on technical or economic terms, but also in terms of political and social dynamics, the possibilities to meet the water needs of CDOC, and its linkages to forest conservation policy and programs. It describes water-dependent sectors and accounts for the economic benefits they derive from the CDORB. It also identifies potential technical and institutional options for supply and demand management and forest conservation to provide adequate water services for the various sectors. This chapter applies the systematic literature review method in which existing studies are aggregated, reviewed, and assessed. The main goal is to identify, critically appraise, and summarize the existing data about the CDORB and the water users in CDOC on the status of interrelated pressures to water management that pose sustainability issues needed for more holistic and responsive policy and regulation. The review and analysis on the sustainability issues of the various downstream users in CDORB provides insights on how competing demands for water are likely to play out in different settings. Cagayan de Oro City's water-dependent sectors rely on a number of ecosystem services that are critical for sustaining its growth and expansion, and the CDORB's ecosystem services are under serious threats that must be urgently attended to. There are also a number of challenges in dealing with transboundary water bodies governed by multiple agencies of the CDORB. In this Anthropocene epoch, the challenge lies on the increased capacity to regulate the actions of multiple users and determine how they can be changed to secure economic and sustainable development in the CDORB.

## Background

River basin management has a strong tradition based on addressing environmental problems with technical solutions (Chen et al. 2005). Strategies in the planning and decision-making processes have started to evolve dramatically based on harmonious and environmentally sustainable ways and the inclusion of human dimensions (Almaden 2015; Rola, Pulhin, and Rosalie 2018). There is an increased emphasis on the accounting for social demands due to demographic pressures, changes in perspectives of the economic value of water, and climate change (Falkenmark, Wang-Erlandsson, and Rockström 2019).

The integrated approach to river basin management seeks to balance economic and demographic pressures, human water needs, environmental water needs, and a changing climate particularly in the context of the Anthropocene (Carr 2015). The onset of the Anthropocene poses challenges for forest management because of unprecedented changes in spatial distribution, structure, and composition. However, it also opens up opportunities for the creative management of forests to fulfil multiple values (Sun and Vose 2016). Increasing pressures on urban water resources incur added cost and highlights the inefficiencies of current water allocation regimes. Consequences of poorly functioning allocation include degraded environmental performance, lost opportunities for economic development, and unbalanced management of the risk of shortage (Brown, Dayal, and Rumbaitis Del Rio 2012; Molle and Berkoff 2009; Satterthwaite 2011).

Expanding urbanization entails increasing water demands for domestic, industrial, and commercial uses. These competing demands of burgeoning urban economy pose enormous sustainability challenges to the social, political, and physical environment of both upstream and downstream sectors of a watershed such as CDORB.



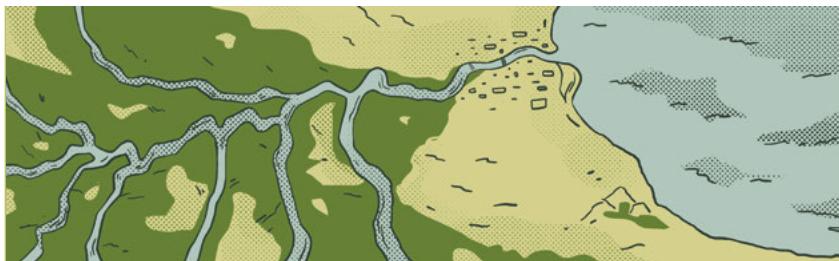
The main objective of this chapter is to examine the sustainability issues and water pressures from the downstream economic sectors in the Cagayan de Oro River Basin (CDORB), specifically Cagayan de Oro City (CDOC). It provides a purview of the ecological services derived from CDORB by the downstream water users and an integrated analysis on the technical, socioeconomic, and policy issues that influence sustainability and forest conservation. Intersectoral linkages, issues, challenges, and opportunities besetting the downstream economy are examined to provide insights on how competitions among water sectors play out in different scenarios. Potential technical inputs,

institutional arrangements, and relevant policy for water management and forest conservation are identified. In conclusion, it outlines the implications of current water demand pressures of the CDOC downstream economy to policy development, the local forestry sector, and attainment of an integrated and sustainable river basin management.

## Methodology

This chapter applies the systematic literature review method in which existing studies are aggregated, reviewed, and assessed. It aims to present a critical appraisal of the status of water-dependent economic sectors of CDOC, policy challenges, and sustainability issues besetting CDORB. Systematic literature reviews allow for the examination of coincident findings, as well as to identify themes that require further investigation. The method is particularly useful for the integration of information based on the objectives of the study and the selection of appropriate studies based on certain criteria (Aromataris and Riitano 2014). The bulk of secondary data on CDORB were sourced from the Department of Environment and Natural Resources Region 10 and the City Local Environment and Natural Resources Office (CLENRO) of Cagayan de Oro City. The data and information on water demand were gathered from the Cagayan de Oro City Water District (CDOWD). Secondary data related to the socioeconomic profile of CDOC were mainly obtained from the Philippine Statistics Authority (PSA). These secondary data were analyzed using descriptive statistics and trend analyses. Relevant findings from academic and research publications were also integrated in the discussion and analysis.

Basic spatial analysis was also employed through mapping of specific attributes of the water-dependent sectors covered in the study. This is intended to present patterns in characterizing the various sectors. The generation of analytical maps accompanying the tables and figures can potentially improve the analysis of a wide range of issues, letting policymakers, planners, and those who are not familiar with spatial analysis interact directly with relevant information (Lieske 2015; Zomer et al. 2008).



### Brief Profile on CDORB and CDOC

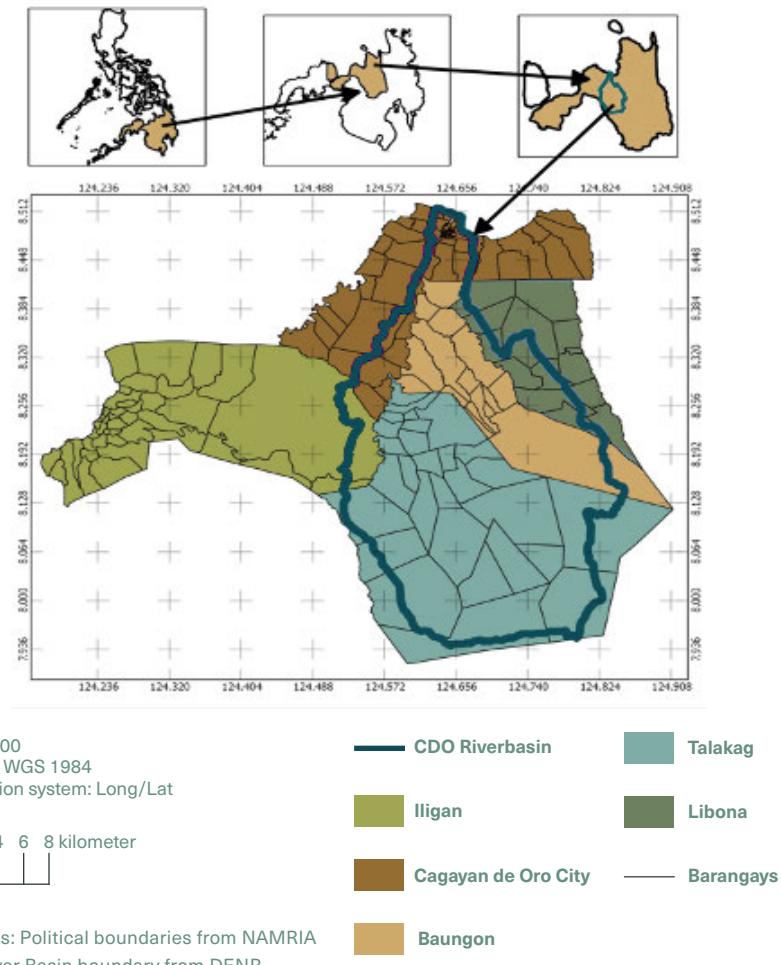
The Cagayan de Oro River Basin (CDORB) is one of the major river basins in the country with an estimated length of 90 km and aggregate drainage area of 1,374.16 km<sup>2</sup>. The river has its headwaters in the Kalatungan Mountain Range in the central region of Bukidnon province which joins those that come from the Mount Kitanglad Mountain Range, flows north, and picks up tributaries along the way as it traverses seven municipalities in three provinces, namely: Baungon, Talakag, and Libona in Bukidnon; Iligan City in Lanao del Norte; and Cagayan de Oro City in Misamis Oriental. The extensive networks of rivers and streams, which are located almost entirely in Bukidnon, converge into the main channel as water flows toward Misamis Oriental and finally drains into Macalajar Bay at its mouth in Cagayan de Oro City (Table 1, Figure 1).

**TABLE 1.** Areas of the various Local Government Units in the CDORB

LOCAL GOVERNMENT UNIT	AREA (HA)	%
Baungon	25,715	18.57
Libona	18,423	13.30
Talakag	63,596	45.91
Cagayan de Oro	10,856	7.83
Iligan City	12,079	8.72
Others, conflict areas	6,715	5.67
Total	137,384	100

Source: Data from CESM (2014)

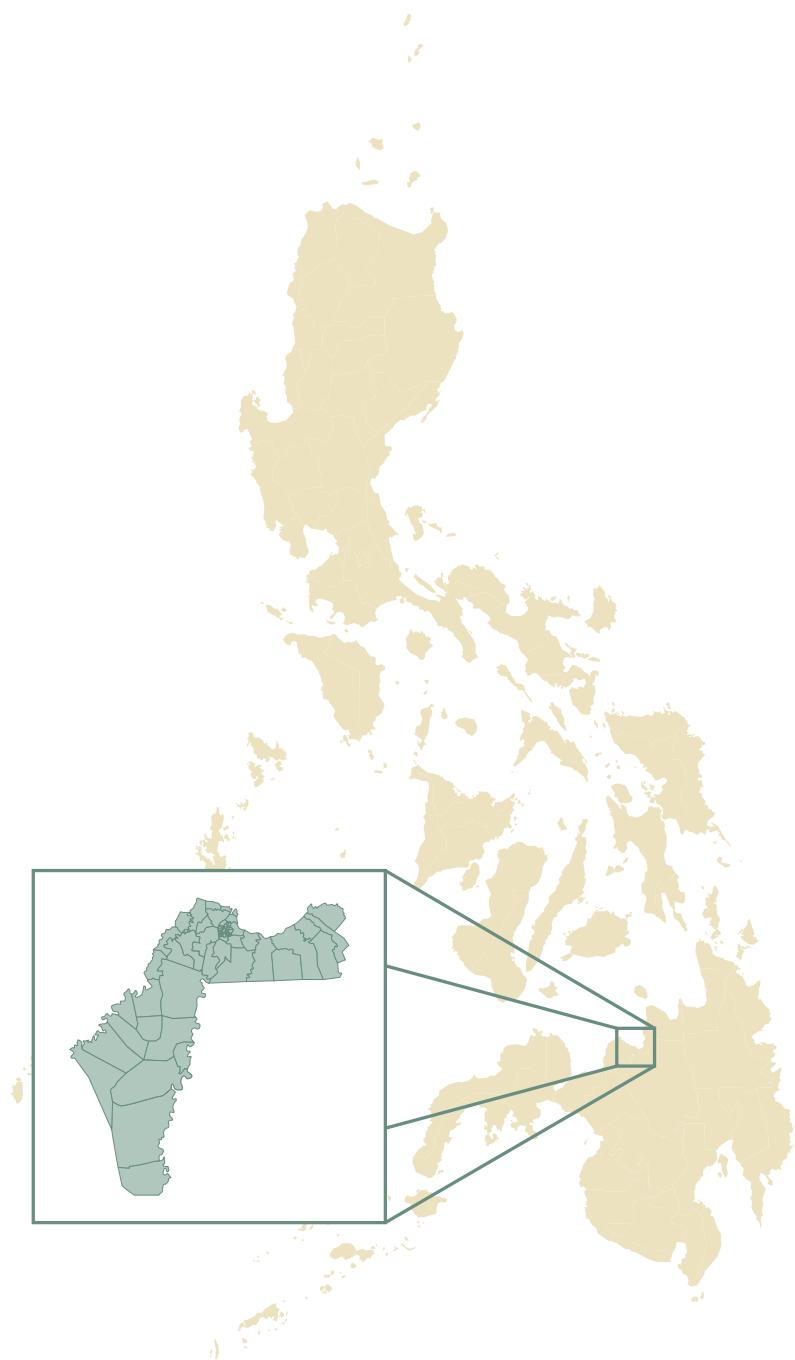
Steep slopes are predominant in the upland area in the south and southeastern portion of the basin, where majority of the river's headwaters are located. They can also be found in the ridges of sub-basins where they serve as a topographic divide between sub-catchments. Gentler slopes and lower elevations prevail along the coast and on the flat portions of several elevated terraces around the basin.



**FIGURE 1.** Location Map of CDORB

Cagayan de Oro City (Figure 2) is geographically situated between the central coastline of Macajalar Bay to the north and the naturally lush plateaus and mountains of Bukidnon and Lanao del Norte to the south. The municipality of Opol bounds the city on the west side while Tagoloan, with its heavy industrial activities, is its immediate neighbor to the east.

The city has a total land area of about 462 km<sup>2</sup>. It is politically subdivided into 80 barangays, 57 of which are urbanized barangays and 23 are classified as rural barangays. These are grouped into two congressional districts: 24 barangays in the First District (West) and 56 barangays in the Second District (East), with Cagayan de Oro River as the natural boundary.



**FIGURE 2.** Location Map of Cagayan de Oro City

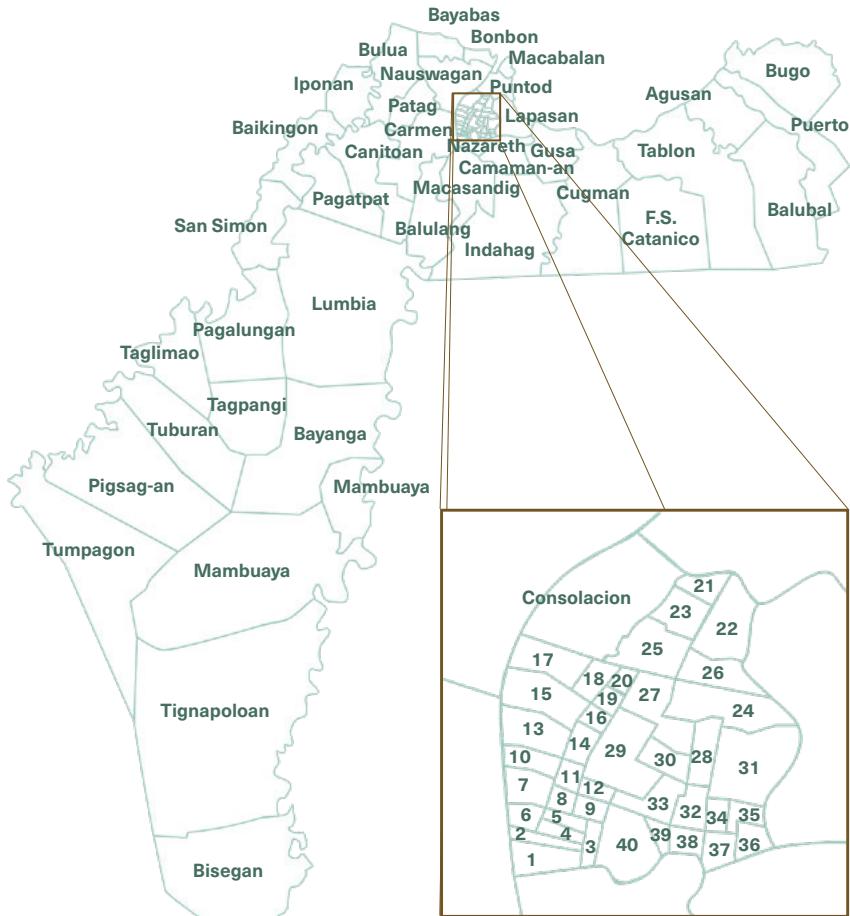
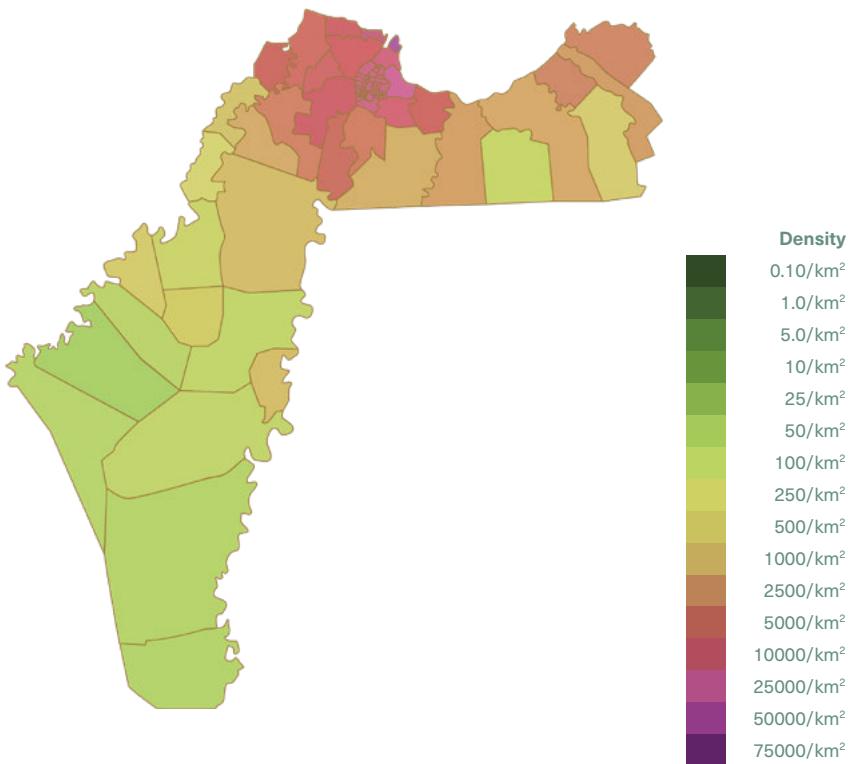


FIGURE 3. Location Map of Barangays of Cagayan de Oro City

## Discussion

### Urbanization Trends in Cagayan de Oro City

From  $338/\text{km}^2$  in 1975, population density almost tripled to  $872/\text{km}^2$  in 1995. Originally, the so-called Poblacion refers only to the urbanized section of the city. This is no longer the case, as 57 barangays have already been classified as urban in 1994. Urban zones encompass 40 Poblacion barangays and 17 adjoining urbanizing barangays. These account for 20 percent of the city's total land area and the concentration of 82 percent of its population at  $3,519/\text{km}^2$ . The remaining 23 rural barangays have an average population density of  $203/\text{km}^2$  (Figure 4).

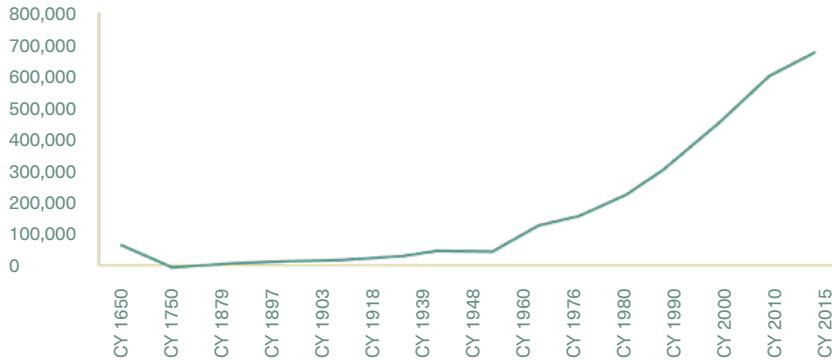


**FIGURE 4.** Population Density of Barangays in Cagayan de Oro City

Population growth is considered as one of the exogenous drivers of water use. As of May 2015, the total population of CDOC is at 675,950 and population density of the urban barangays has risen to  $5,462/\text{km}^2$ . The 2015 figures translated to an annual population growth rate of 2.23 percent. The population represents the people who are located within CDORB and considered in the water demand projection. The total population in urban/urbanizing and rural barangays within the CDORB is estimated to increase from 572,283 in 2010 to 808,418 in 2030. Based on the present growth rate, the population will double in the span of 31 years or in 2046. As of 2015, the city has 683,793 in total household population with an average household size of 4.4.

The influx of people from nearby municipalities and current population growth rate of the city create pressure on job creation, among others. Labor force participation rate in the city is gradually rising at an annualized growth of 1.22 percent.

The large bulk of the city's income comes from the internal revenue allotment (IRA), constituting at least 75 percent. The rising local sources of revenue are due to the tax collected from businesses and property. The



**FIGURE 5.** Actual Population Trend in Cagayan de Oro City

sprouting establishments covering the central business district, the recent expansion in the uptown area, and the rising number of landmarks and subdivisions are reasons of the appreciation of the value of land and increased collection of taxes (Almaden and Navarro 2018).

As the city grew, several nodes began to emerge. The Poblacion where main urban centers are located functions as the major node, while the southwestern part of the city, especially around Pueblo de Oro, is a new nodal point. Smaller nodes occur at the barangays Lapasan, Carmen, Bulua, and Puerto. The Poblacion and its contiguous areas comprise the present Central Business District (Figure 6).

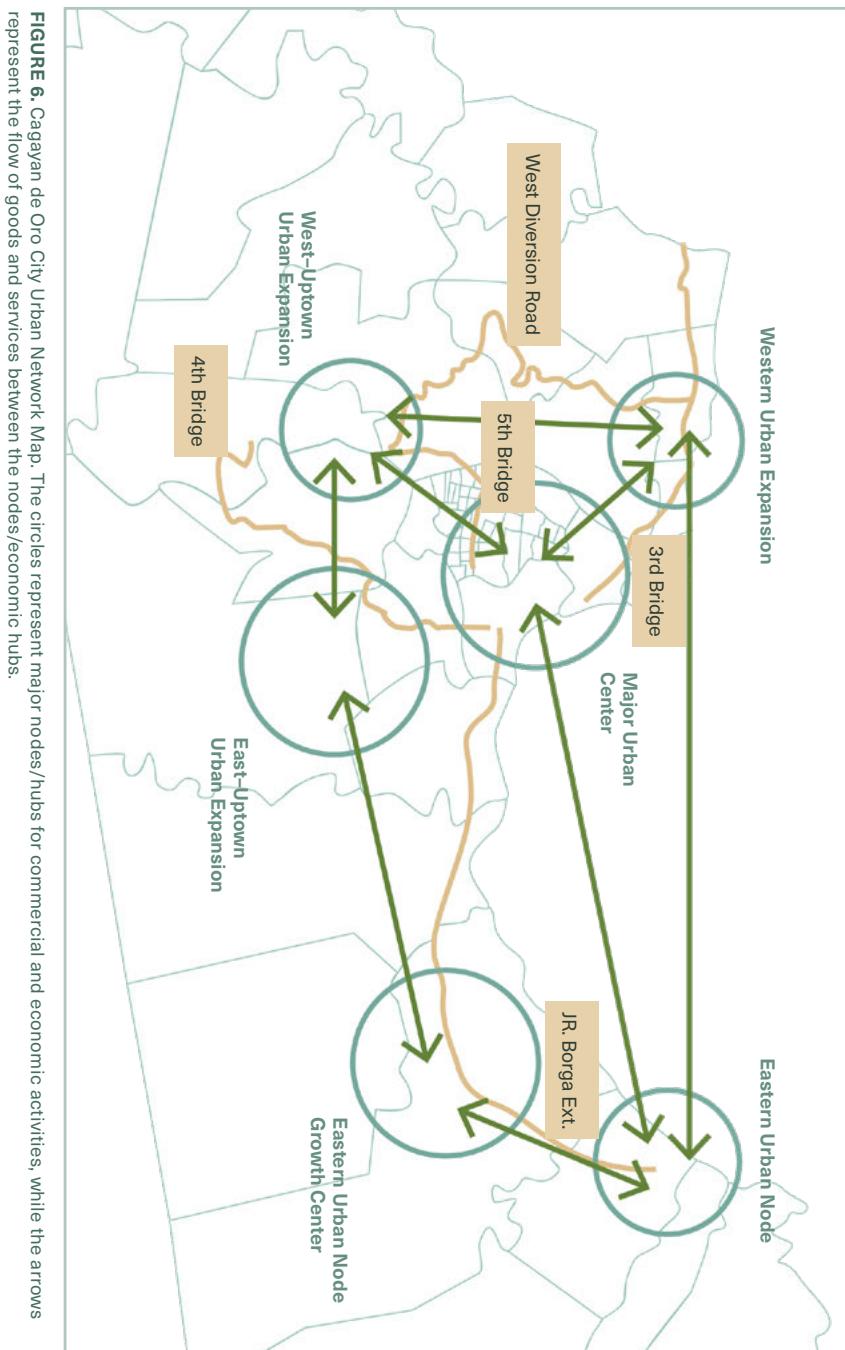


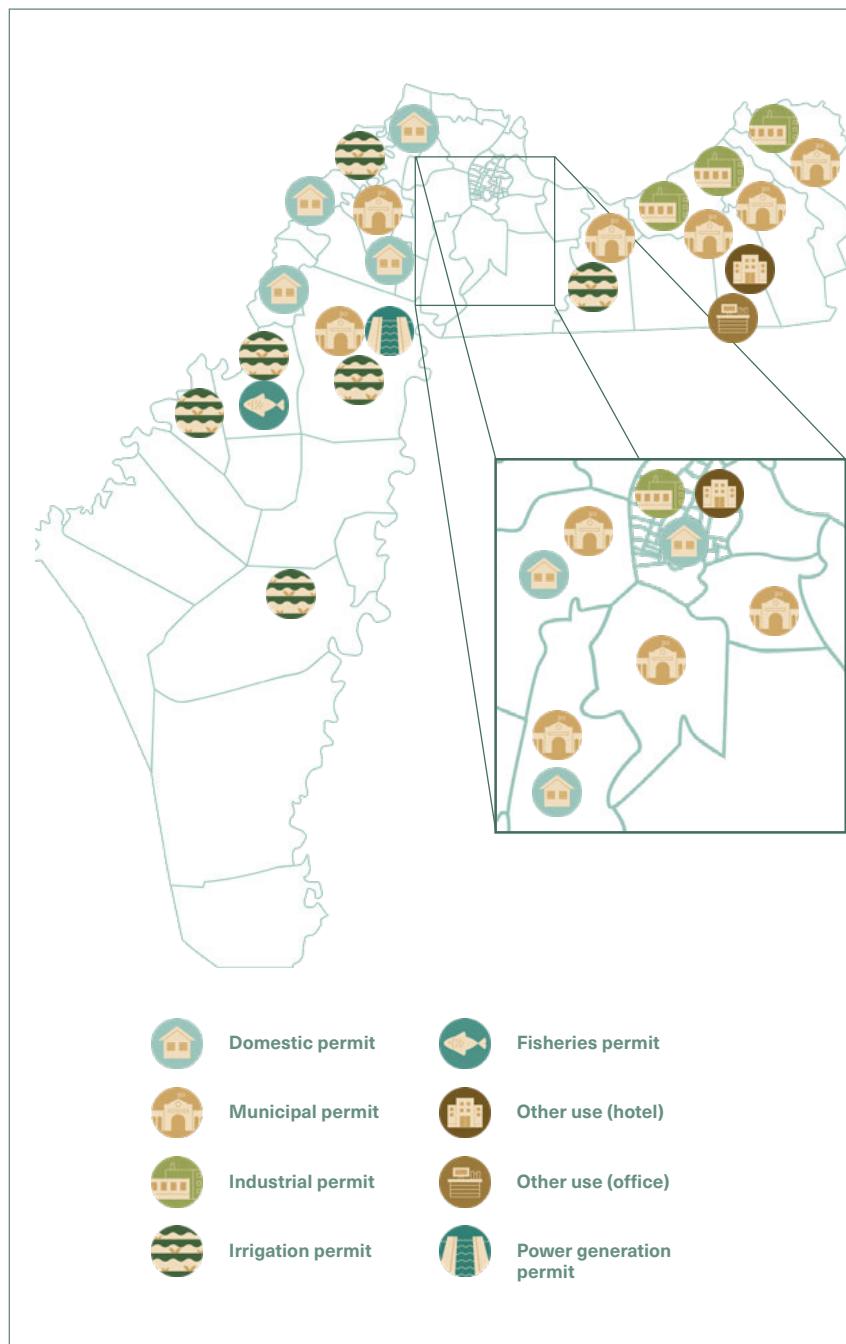
### Sustainability Issues in Water Dependent Sectors in Cagayan de Oro City

#### Urbanization Pressures

##### *Increasing demand for water for domestic use*

Use of water for domestic purposes is the utilization of water for drinking, washing, bathing, cooking or other household needs, home gardens, and watering of lawns or domestic animals. Per capita domestic water consumption varies considerably over the globe. In developed regions one can assume an average value of 200 liters per capita per day (l/c/d). The value adopted internationally for basic human water needs is about 50 l/c/d (Gleick and Palaniappan 2010). The Level 3 domestic per capita consumption for Cagayan de Oro City in 2010 is estimated at 180 l/c/d. By adding other types of consumption (commercial, industrial, institutional), other uses (irrigation, recreation), and unaccounted-for water (leakage, illegal connection, etc.), the total per capita consumption is estimated at 360 l/c/d,





**FIGURE 7.** Permit types and classification per barangay in Cagayan de Oro City

BARANGAY	PERMIT GRANTEES				
	DOMESTIC	MUNICIPAL	INDUSTRIAL	IRRIGATION	FISHERIES
					
Agusan		2		3	
Baikingon		1			
Balulang	2		5		
Brgy. 24	2			1	
Bugo		5		7	
Bulua	6				
Camaman-an		1			
Canitoan	4		5		
Carmen	1		1		
Cugman		4		3	
Dansolihon				1	
Iponan				1	
Lumbia		3		1	
Macasandig		10			
Pagalungan				1	2
San Simon	1				
Tablon		2		8	
Taglimao				1	

which requires 142,607 m<sup>3</sup>/d to satisfy the water demand of the served Level 3 population in 2010. The remaining population not served by Level 3 water supply utilized point sources or communal faucets or springs for their domestic use, which is estimated at 80 l/c/d. Adding other types of consumption (commercial, institutional) and other uses (irrigation, recreation), the total estimated per capita consumption for Level 1/Level 2 population is estimated at 120 l/c/d, assumed to increase at 1 percent per annum.

Other water utilities/companies present in CDOC cater to very specific groups/areas in the city, such as some areas in a barangay not easily reached by CDOWD water due to elevation or groups of subdivisions served by a water system developed by a real estate company. There is still a substantial proportion of households that rely mainly on public/community taps and public/community wells which provide free water. There are seventeen domestic permits approved by the National Water Resources Board (NWRB) in CDOC, most of which are classified as subdivisions and real estate developers that provide their own water system for residential use (Figure 7).

Based on the study conducted by Palanca-Tan in 2011, it can be deduced that there should have been an increase in domestic water permits given that demand in CDOC is growing due to continuing expansion and increase in the number of new subdivisions that cannot be serviced by CDOWD and have their own private construction of deep wells. The past decade witnessed the mushrooming of hotels, commercial complexes, and residential subdivisions in CDO, most of which put up their own deep-well systems. The study was able to generate a list of non-COWD deep wells which indicated the number of subdivisions, industries, and institutions (hospitals, schools) with their own deep well systems. Six subdivision developers and management companies are providing for the water requirements of 27 subdivisions through their own deep-well systems.

Table 2 presents the water demand projection from 2010 to 2030. From the estimated total consumption of 170,063 m<sup>3</sup>/d in 2010, total consumption will increase to 331,187 m<sup>3</sup>/d in year 2030.

**TABLE 2.** Groundwater Potential vs. Projected Water Demand

CONSUMPTION	2010	2015	2020	2025	2030
Total Estimated Consumption	170,236	203,337	241,474	284,081	331,187
GW Potential	539,427	539,427	539,427	539,427	539,427
GW Potential - Consumption	369,191	336,090	297,953	255,346	208,240
% of Consumption to GW Potential	31.6	37.7	44.8	52.7	61.4

Source: Data from CESM (2014)

With increasing population and number of households, it is expected that the residential areas in CDOC should reflect the economic importance of domestic water use in the area. Therefore, it is useful to see the geographical dispersion of the various settlement sites within CDOC. Correspondingly, a comparative study of the total number of households that have access to a network of water supply should be considered. The domestic water consumption must also reflect not only the aggregated size of water demand, but the demand across geographical scales.

Moreover, considering that population growth will focus in urban areas of CDOC in the coming years, this new demand will be added to the existing backlog of people still to be served. Currently, water shortage has been experienced in most barangays being serviced by the CDOWD and rationing has been implemented for several years now. There will be considerable difficulties in planning an infrastructure system that is adequate to future forecasts, and expandable as needed. To meet the need, ensure sustainable expansion, operate efficiently, and maintain a high quality of life for residents, CDOC will have to approach this problem using smart logic. Making CDOC a smart city would mean significant investment in water infrastructure must be appropriated.

With a growing population size and a greater freshwater demand, large volumes of wastewater are also generated, especially in densely populated areas. As a result, aquatic ecosystems may contain harmful constituents, including sewage (Brown, Dayal, and Rumbaitis Del Rio 2012). This a major concern in CDOC; it has no sewerage system and the existing rivers and creeks provide a natural drainage system. Most of the domestic sewage is dumped without treatment into the Cagayan de Oro river system. The primary sanitation facilities of residences, offices, and commercial establishments are septic tanks, which are unable to achieve the required pollution parameters required by DENR (Cities Development Initiative for Asia 2013).



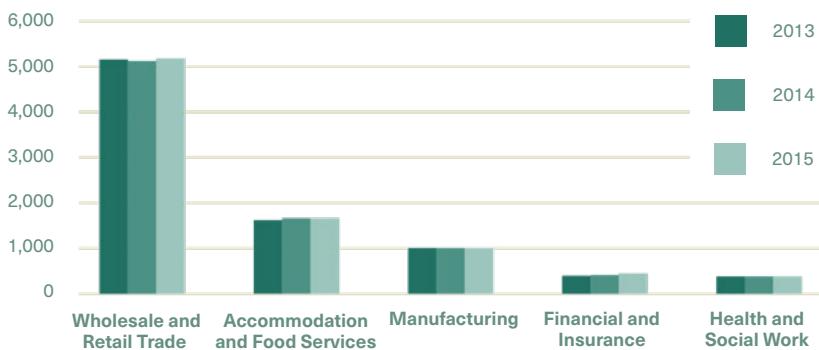
#### Equity Issues Among Municipal, Industrial, and Commercial Users

Cagayan de Oro City continues to be the major hub of economic development activities in the Northern Mindanao region. In positioning itself as a preferred investment destination, the city consistently pursues its objectives along increased agricultural productivity, sustainable mining, manufacturing and construction activities, tourism revenues, and foreign and domestic investment.

In 2015, wholesale and retail trade continued to be the leading commercial activities in the city which accounted for 53.93 percent of total business establishments that year, with businesses engaged in community,

social, and personal services trailing behind them at 14.36 percent (Figure 7). There are currently about 17,000 production-related businesses operating in CDOC with an approximate 1 percent rate of increase annually.

The city's top 30 manufacturing firms in 2015 reported total gross sales of PHP 20.923 billion, with manufacturers of essential items accounting for 74.3 percent (PHP 15.536 billion) of the gross sales and non-essential manufacturers at 25.7 percent (PHP 5.387 billion). The top 3 gross sales earners are engaged in food production (41.7 percent of total gross sales), non-essential manufacturing activities (25.7 percent), and agricultural manufacturers (19.2 percent). Collectively, these three firms accounted for 90.4 percent of the manufacturing sector's total gross sales during the said year.



**FIGURE 8.** Business Establishments by Major Industry

Over the years, exports in Misamis Oriental relied largely on traditional products such as canned pineapple, sintered ore, crude coconut oil, finished lumber/wood products, activated carbon, fatty alcohols, refined glycerine, dessicated coconut, and coconut shell charcoal. The province's top 10 imports are minerals, hot rolled steel sheets, tin plates, chemicals, fertilizer, live animals, foodstuff, logs, carton making materials, and forest products. Majority of these commodities are used by industries in the manufacturing, repair, services, and agriculture sector. The major exporting countries are Brazil, Japan, Australia, Canada, and USA, among others.

As noted above, municipal and industrial water users are among the biggest number of users and abstractors of groundwater in the city. Use of water for municipal purposes is the utilization of water for supplying the water requirements of the community.

The increase in total municipal water demand in CDOC is driven mostly by the increase in urban population. In most emerging cities, there is also the tendency for economic development to increase the portion of the urban population that uses municipal supply rather than other sources, such as communal wells (Leigh and Lee 2019).

Cagayan de Oro is being served by a Level 3 system through the Cagayan de Oro Water District (CDOWD). The CDOWD is the first water district in the Philippines and was formed in August 1973, the same year that the country's Local Water Utilities Administration (LWUA) was established. To date, COWD's water supply system serves a population of 580,000, has a water supply capacity of 163,000m<sup>3</sup>/day, and has a Non-Revenue Water (NRW) rate of 56 percent. The total length of COWD's distribution pipeline is 510 km, with about 54 percent of these PVC pipelines and 30 percent of these more than 30 years old. These factors are major causes of the high NRW rate. Thus, replacing the old and weak pipelines is essential for COWD to decrease the rate of NRW.

As of December 2019, the National Water Resources Board (NWRB) has granted 183 permits for tapping groundwater and surface water sources in Cagayan de Oro, Bukidnon, and Iligan City. Out of the 183 permits, 133 are granted to permittees located within CDORB, with 88 in Cagayan de Oro and 45 in Bukidnon. The two barangays in Iligan City which are covered by CDORB do not have any permits from NWRB. Majority of NWRB-permitted extractions within the basin are from groundwater sources for industrial and municipal consumption.

As shown in Table 3, a total of 1,285.30 lps or equivalent to 111,049.59 m<sup>3</sup>/d of water has been extracted from the groundwater reservoir daily by the 77 users for different purposes in CDOC. This represents an increase of 65.85 percent relative to 2012 data. In 2012, a total of 756.89 lps or equivalent to 65,395 m<sup>3</sup>/d of water has been extracted from the groundwater reservoir daily by the 72 users for different purposes.

Like many countries in Asia, groundwater constitutes the primary resource for most cities and remains a valuable reserve water resource for countries that may have ample surface waters (Gleick and Palaniappan 2010; Helweg 2000). In the same manner, it is responsible for providing freshwater to coastal cities like CDOC. Rapid urban transition in CDOC is largely supported by the easy and adequate access to groundwater. However, benefits of groundwater use have come at the cost of resource depletion and degradation. In many cities in Asia, urbanization, population growth, industrial development, and the impacts of climate change are exerting huge pressure on groundwater resources (Grimaldi, Pellecchia, and Fasolino 2017). In Metro Manila for instance, resource sustainability is already threatened due to unwise development and use of groundwater and the increasing pollution.

Municipal consumption is highest at 713.54 lps or 61,649.856 m<sup>3</sup>/d and represents 55.52 percent of the total daily groundwater extractions. Municipal use is mainly for Level 3 or piped water supply with a private water point from water districts and municipal water supply systems (ADB 2013). Municipal permits are concentrated in 10 urban barangays in the city (Figure 7). Industrial use represents the second biggest consumption of groundwater at 474.56 lps or 41,001.984 m<sup>3</sup>/d, equivalent to 36.92 percent of the total. Industry used to be the biggest consumer of groundwater at 346.8 lps or 29,963 m<sup>3</sup>/d, equivalent to 45.8

percent of the total in 2012. This may be attributed to the relocation of certain manufacturing firms outside the Cagayan de Oro City area.

Figure 7 shows that a significant portion of the Poblacion barangays of CDOC is host to four types of users: domestic, municipal, industrial, and commercial. Based these results we can see that an extensive portion of the territory may be unsuitable to host additional users or extensions of the water network. These same areas are also major sites of residential expansion, with the proliferation of high-rise condominiums in the city as well as the concentration of major malls and commercial buildings.

These areas have indirectly increased the costs of their transformation, as urbanization infrastructure-related expenses will be high. Data analysis,

**TABLE 3. NWRB-Permitted Groundwater Extractions by User/Category, as of 2019**

PURPOSE	CAGAYAN DE ORO		BUKIDNON		TOTAL		% OF TOTAL EXTRACTION
	# OF PERMITS	CAPACITY* LPS	# OF PERMITS	CAPACITY* LPS	# OF PERMITS	CAPACITY* LPS	
Power Generation	—	—	—	—	—	—	0.00%
Livestock	—	—	1	0.040	1	0.040	0.00%
Irrigation	1	10,000	1	13,390	2	23,390	1.80%
Domestic	17	84,930	—	—	17	84,930	6.54%
Industrial	19	474,560	—	—	19	474,560	36.54%
Fisheries	2	0.218	—	—	2	0.218	0.02%
Municipal	35	713,540	—	—	35	713,540	54.94%
Other Use	3	2.054	—	—	3	2.054	0.16%
<b>TOTAL</b>	<b>77</b>	<b>1,285,302</b>	<b>2</b>	<b>13,430</b>	<b>79</b>	<b>1,298,732</b>	

\*Volume of extraction granted by NWRB

Source: Data from NWRB(2019)

then, should incorporate the choices to be made in the city plan regarding the placement of additional demand of services. On one hand, allowing more economic activities in the area will only result in increasing investment costs if the concept of densification of services and buildings are not considered (Li 2013; Stoker et al. 2019). Nonetheless, utility providers usually support this scheme since in highly urbanized and dense areas with high service coverage, it is possible to serve more users with lower implementation and management costs. Conversely, in slightly urbanized and scattered areas with low service coverage, it takes several meters of network to serve a few users, which results in very high costs of implementation and management. The logic of densification become a major consideration in the attainment of economy and efficiency (Grimaldi et al. 2017). With this, the suitability of additional investments in the areas for expanding productive activities must also consider the suitability for water service networks.

Apart from increasing water demand, another problem currently faced by the CDOWD is significant water losses in the distribution network, also known as non-revenue water (NRW), which can reach as high as 54 percent of the volume introduced. This is commonly due to the poor condition of water pipes and obsolete infrastructure. NRW also usually goes up when there are road and building construction projects, as well as losses due to pilferage; leakages in pipes, joints, and fittings; pipe repairs; and reservoir overflows. This was also exacerbated by budgetary constraints and government red tape since CDOWD was reverted to government control (JICA 2014). This points to an equally critical issue in water resource management in the city: inefficiency. The current status of groundwater depletion in Cagayan de Oro may be controlled to a substantial extent by addressing inefficiencies in CDOWD's operations.

The problems with leakage are not only related to the efficiency of the network, but also to water quality (contamination of drinking water if the pressure in the distribution network is very low). Leakage reduction applies to both distribution and customer supply networks (Stoker et al. 2019).

The growth and geographical shifts of population in CDOC has entailed an increase in built-up areas and changes in commercial and industrial land uses. Data on land use changes from the City Assessment Department revealed that residential and commercial areas almost doubled, reflecting the urbanization process, while industrial lands grew more than tenfold from the last twenty years.

Figure 7 shows there are nineteen industrial permit grantees in four barangays. These barangays are found in the eastern side of the city where most manufacturing firms agglomerate. Surprisingly, this data for 2019 is much lower than the data in the 2011 study of Palanca-Tan wherein 46 deep wells were identified to be owned by both industrial and commercial companies.

Plans for expansion in the industrial zone of CDOC are likely now that the demand for industrial water use will increase, considering the need for new land for the establishment of industrial units (Table 4). Industrial water supply is

estimated to have an increasing trend if the relevant city government plans are realized. If so, the competent bodies for providing water services in CDOC will be of particular interest. As a response, water provision and treatment as well as water abstraction points must be diversified across the competent bodies, so that different quality, quantity, and charges for water must be observed.

**TABLE 4.** Projected Water Demand per Sector

UNIT: M <sup>3</sup> /CAPITA/DAY	2010	2015	2020	2025	2030
Municipal*	88,318	104,460	123,782	145,339	169,143
Commercial/Industrial/ Institutional	24,879	31,338	37,135	43,602	50,743
Other Uses	17,614	20,889	24,756	29,068	33,829
Unaccounted for Water**	39,425	46,650	55,801	66,072	77,472
Total	170,236	203,337	241,474	284,081	331,187

Note: Percentage of population served for Baungon, Talakag, and Libona is taken from their respective Comprehensive Land Use Plan (CLUP)

\*Municipal Consumption is composed of Level 1&2 and Level 3 water supply

\*\* Unaccounted for water is due to leakage, illegal connection, etc.

Determinants of industrial water use and return vary from industry to industry as they are influenced by the technology employed (McGrane 2016). In CDOC, there is a current shift of productive activities concentrating on commerce and trade. A growing concern in the city is not only water provisioning for the increasing water demand from these sectors, but also the effluents as byproducts of water use from these sectors. Sewerage and water treatment facilities remain almost nonexistent, and stringent standards or regulations governing the quality of discharge waters have not been intensified to encourage recycling of industrial and commercial water, which would allow for significant reductions in total water used as well as a reduction in the quantity of wastewater discharged. Commercial and public uses of wastewater are currently not well studied and understood. Again, a more complete picture could be obtained by also checking the effects of droughts on the use of water in these sectors.

For industries that recycle water, the cost of recycling a unit of water could also be estimated. All these methods reflect the upper bound that industry sets on the value of water (Joachim et al. 2015).



## Exacerbation of Sustainability Issues with Climate Extremes

### *Agriculture*

The availability of water is a key factor for the development of agriculture, as well as a requirement in satisfying the increasing needs of the population as standards of living improve (Strzepek and Boehlert 2010). In the case of the CDORB, it performs a dual function in providing livelihood to upland farmers in CDO and in preserving the agricultural resource base. The upland area surrounding CDO is critical in maintaining the ecological balance of the city. It provides the necessary watershed that ensures steady flow of water supply, prevents siltation of the river system, and minimizes occurrence of floods. It also supports agriculture that can produce food needs of farming households while enhancing fertility of the soil.

In 2015, agriculture accounted for the use of 32.4 percent (18,744 ha) of the city's land area (57,851 ha). The agricultural areas of CDO are located mostly in the rural barangays, although patches of productive agricultural lands are still found in the lowland barangays, some of which already belong to the urban classification. Existing agricultural areas of the city totaled 16,393.39 ha.

The city's agricultural land, comprising about 53.4 percent, is dominantly used for crop production that includes rice, corn, vegetables, and various commercial crops (Table 5). Areas devoted for coffee, cacao, fruits, and nuts have significantly increased in recent years.

**TABLE 5.** Area of Crops Harvested in Cagayan de Oro City

CROPS	AREA OF CROPS HARVESTED (IN HECTARES)		
	2010	2016	% CHANGE
Corn	2,848	2586.5	-9.18
Rice	104	77	-25.96
Vegetables	587.5	295.9	-49.63
Banana	1,225.5	866.8	-29.27
Rootcrops	931	990	6.34
Coffee & Cacao	52.5	100	90.48
Fruits & Nuts	846.5	13,789	1,528.94
Abacá	14	31.5	125.00

TABLE 5 (CONT'D)

Coconut	50.4	2,862	5,578.57
TOTAL	6,659.40	21,598.70	224.33

Source: Data from Cagayan de Oro City Agriculture Office (2017)

The current NWRB data shows an increase in total number of permits granted for irrigation from surface water, from only two in 2012 to eight in 2019 (Figure 7). It can be attributed to the increase in production areas for coffee, cacao, and fruit trees based on the latest data for 2019. Seven of the permits are for surface water extraction and only one permit is sourced from groundwater. All of these permits are intended for irrigation purposes for crop production. Four permits are located in four rural barangays while another four are two urban barangays.

Where water demand for agriculture is increasing, irrigation typically takes over (Dziegielewski 2003). This might be the case in CDOC. The city faces the challenge to reliably produce more supplies and more varieties of food. As a result, higher pressures on water for food production may be expected to develop because large segments of the population in the city will tend to raise their standards of living. Consequently, increasing urbanization will impact the volume and quality of water available for agriculture, particularly in peri-urban areas. Increasing demand for water in cities, industries, and for environmental flows will reduce the volume of water available for agriculture.

Just like other sectors, the threat of droughts can have serious negative impacts on the water quality needed for irrigated agriculture. The most recent episodes of drought have adversely affected many farmers in the rural barangays in the city.

The case of the Higaonon community in Dansolihon, an upland barangay in Cagayan de Oro, presents a case of a vulnerable farming system where a narrow focus on productivity may not be sustainable. Most of the Higaonon people cultivate logged-over timberland, which is technically owned by the government. With high elevation and sloping terrain, soil is easily eroded, causing siltation of the rivers. As a way of addressing this problem, the national government launched the strategy of Community-Based Forest Management (CBFM) where the communities are tapped to rehabilitate, protect, and conserve the forests by granting them the management and sustainable use of the remaining forest resources. To formalize this arrangement, the forest occupants are given a certificate of stewardship contract (CSC) for individual farmers or families, a Community-Based Forest Management Agreement (CBFMA) for the entire community, and/or a Certificate of Ancestral Domain Claim (CADC) for organized indigenous communities. With the awarding of this tenurial instrument, the farmers have secured their place in the community, opened access to other services such as credit, and started to make long term plans in increasing agricultural productivity and in conserving the resource base (Ravanera 2001).

### Fishery

CDOC is a coastal city, and for this reason, a good number of families still depend on fishing as their major source of income. Coral reefs are found along the coastline of eleven barangays along the Macajalar Bay. In addition, inland artisanal fishing is also practiced in several communities in CDOC, mostly those found along the river areas. The author's research in 2015 estimated that the total population of fishing communities in the city was less than 5 percent of the total population, and that there are only two fishery permittees in CDOC in the 2019 record of NWRB. These are found in the rural barangays in the hinterland section of the city (Figure 7).

A study of the author in 2015 analyzed artisanal fishery in the CDORB. Artisanal fishing is an important socioeconomic aspect of the communities in the CDORB, but has remained undocumented by Local Government Units (LGUs) as it does not contribute directly to the economy in terms of measurable cash flow. Very little was known of the scope and magnitude of artisanal level fishing activities within the CDORB, as it is an ancillary livelihood in most of the areas. Most fisherfolk have subsidiary occupations which serve the dual purpose of alternative income and job opportunities, as well as food source, since fishing is seasonal (the peak fishing season usually spans two to four months). In rural communities of CDORB, most fisherfolk resort to farming as their subsidiary occupation at the onset of the rainy season during which fish catch tends to be lower (Almaden 2017).

There are 26 commonly identified varieties of fish in fishing communities in CDOC. Each area tends to have a different concentration of fish variety. The concentration of fish in each zone tends to vary according to season. *Pigok*, considered as the second most expensive freshwater fish in the Philippines with prices that can go as high as PHP 1,200 per kilo, is considered endemic in CDORB and dominant in most of the downstream and midstream communities, while *carpa* is most abundant in the upstream communities.

The artisanal fishery sector in CDORB has the following elements that can be called almost general characteristics to artisanal or small-scale fisheries (Clifton and Foale 2017): 1) it uses relatively simple technology, 2) it is labor intensive, 3) it consists of small groups of operators, 4) it takes relatively low capital inputs, 5) its marketing and distribution are handled by specialized non-fishing intermediaries, and 6) its risk-aspect is always present. Fishing is a low-status occupation and fishing communities suffer from poor community infrastructure and living conditions. On average, fisherfolk spend around PHP 3,000 pesos a year on equipment.

The peak and lean seasons vary for all zones, and even among communities within the same zone. The peak season in downstream communities tends to coincide with the rainy season. According to fisherfolk in the area, this may be attributed to flooding which increases the likelihood of fish from the upstream river sections to be carried downstream. On the other hand, for most of the midstream and upstream communities, peak season coincides with the dry

season because more fishing activities can be conducted when river water is more manageable. Also, the fishermen are able to dive into deeper channels of the river where potential fish catch is higher with tamer water current. During the rainy season, full-time fisherfolk resort to the use of *besigan* or river traps to ensure continuous fish catch despite harsh river conditions.

The downstream area recorded an average weekly fish catch of only 5–10 kgs of mainly smaller immature fishes. This fishing output suggests that this portion of the river has already been heavily fished. In the midstream communities, average fish catch is almost the same as the downstream, suggesting a similar situation. In the upstream communities, however, the average fish catch is between 10–15 kgs a week, suggesting relative abundance. In most instances, full-time fisherfolk's number of fishing trips per week ranges from four to six. This high fishing frequency is an indication of heavy dependence on fishing as a means of livelihood. During the lean months, fish catch tends to be lower by 40 percent for most of the fishing communities.

Fish prices range as low as PHP 50 and as high as PHP 400 at the fisherfolk's level. Usually, the fish vendor's price is higher by PHP 20–100, depending on variety. Because of the relative scarcity of most of the fishes, prices do not vary much during peak and lean seasons. The fish prices also differ by zone; in rural areas, most of the fishes are cheaper by PHP 20–100. According to the fishermen, the top three most expensive fishes are damagan, pigok, and balanak.

The net value analysis of fish caught in the study area has shown that artisanal fishery generates significantly high net values. These figures are presented in Table 6 below. The table shows that these high net values can be attributed to the relatively low expenditures incurred by fisherfolk in the various areas. Overall, the fishing sector in selected communities along the CDORB generates a total net value estimated at PHP 59 million annually.

The intimate connection between watershed and inland fisheries was also highly valued in terms of the nutritional security and income to hundreds of millions of rural households (Almaden 2017; Clifton and Foale 2017; Nguyen et al. 2016; Welcomme et al. 2010). Although commercially intensive fisheries exist, inland fisheries are generally characterized by small-scale/household-based activities. Participation in fisheries is high and the bulk of the catch is consumed locally. By-catch is insignificant as practically all fish caught are used. This means that their benefits are widely spread. Inland fisheries are also very diverse, being based on a range of ecosystems (Lynch et al. 2016).

Through the years, activities in the upstream communities of the CDORB have adversely affected the fishery sector. The dissertation of Mars P. Tan (2017) studied extensively the sedimentation dynamics of the Cagayan de Oro river and its implications for its catchment in the coastal marine environments of the Macajalar Bay. The study noted the relationship between rain and run-off, which is influenced by a site's spatial variation over time such as rapid increase in the human population, along with an expansion of land-based activities, particularly large-scale land cultivation, mining activities, timber poaching,

quarrying, and logging. Despite the frequent extreme rain events such as the three recent typhoons Sendong (Washi) in 16 December 2011, Pablo (Bopha) in 12 December 2012, and Yolanda (Haiyan) in 8 November 2013, the Cagayan de Oro River catchment remained largely stable, but possesses a small number of erosion-prone sub-catchments, which have a high potential to cause massive floods of water and mud during extreme rainfall events. In extreme discharge events with high-sediment volumes, sedimentation poses a direct threat to both corals and seagrass communities, but not to mangroves.

Nonetheless, river sedimentation has brought benefits to the coastal environment due to the accretion and expansion of landmasses, and later the subsequent colonization of mangrove trees. However, it has also paved the way for major physical modifications to the coast and riverbank, facilitated by human intervention at the expense of naturally growing mangroves. The distribution and abundance of mangroves, corals, and seagrasses within the Cagayan de Oro River coastal environment indicated their response to the sedimentation dynamics. The study acknowledged the need to conduct management interventions at different points along the ridge-river-reef continuum where sedimentation has become anomalous.



#### Quarrying of sand and gravel

Quarrying is an important sector in the Philippines in support of the country's infrastructure and overall economic development. The most important products of this activity are rock aggregates, colloquially known as sand and gravel. They form a significant 39.33 percent of the non-metallic mineral output and 14.49 percent of total mineral production in the country. In addition, the shares of sand and gravel output to nonmetallic mineral and total mineral production generally have been increasing, further manifesting the importance of quarrying to the mining industry (Israel 2001).

Sand and gravel are used intensively in the construction industry, in chemicals and metals processing, and in plastic industry. These multiple utilizations led to an exponential consumption growth and this trend is expected to continue due to population growth and increasing standards of living. The importance of this natural resource is given by the fact that, nowadays, after fresh water, sand is considered to be the second most consumed natural resource on Earth (Dan Gavrilteea 2017). Despite this, their use greatly exceeds their natural renewal rates (UNEP 2014).

Cagayan de Oro City's infrastructure needs have been supported substantially by quarrying of sand and gravel sourced from the Cagayan de Oro River (CDOR) and the Iponan River. These rivers and floodplains have also become

the major sources of sand and gravel for the construction boom in the city. Thirty-three companies in CDOC were granted quarrying permits by the Mines and Geosciences Bureau (MGB) as shown in Figure 9. Twenty-six of the grantees were given permits to quarry sand and gravel along the CDOR and twelve along the Iponan River.

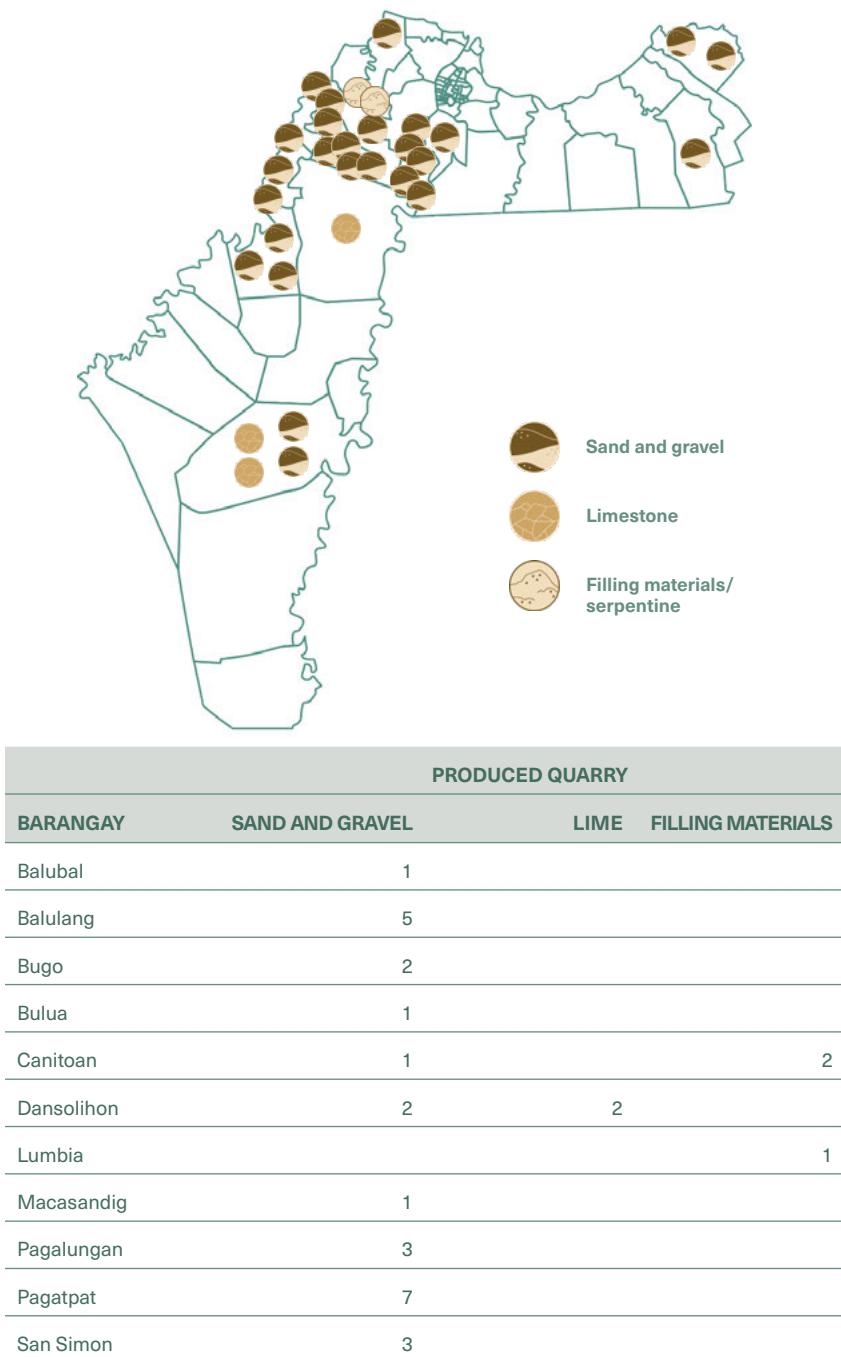
Quarrying and dredging for sand and gravel are contentious issues. While quarrying is important for economic growth, it is also a major natural resource-extractive sector that causes significant environmental problems. The extraction of sand and gravel from the rivers, streams, floodplains, and channels conflict with the functionality of riverine ecosystems (Israel 2001). Some of the disturbance is from the mining methods and machineries used. The most common environmental impact is the alteration of land use, most likely from underdeveloped or natural land to excavations in the ground (Cristóvão et al. 2012; Dan Gavriletea 2017; UNEP 2014).

Siltation results in shallower rivers; shallow waters easily overflow. In the aftermath of Sendong (Washi) in 2011, experts had blamed shallowing and constriction in certain parts of the CDOR due to siltation and accretion. Both are results of loose earth going into the waterway which accumulated over time. Before Sendong, the MGB marked the downstream areas along the CDOR as flood hazard areas and recommended these areas “no-build zones.” They also recommended for the removal of the silt and sand through quarrying. For the construction industry, removing these massive appendices of the river bank is a very good business proposition as these would become an abundant source of affordable filling materials and concrete aggregates.



### Water pollution

With the increasing demand for water, wastewater also increases. A 2019 report of the Monitoring and Enforcement Division of the Environmental Management Bureau (EMB) of Region 10 noted that the CDOR receives some 12,000 m<sup>3</sup>/day of domestic wastewater from inhabitants in barangays along the CDORB. Domestic wastewater combined with rain runoff flows is collected in ditches, flows in discharge points, and then goes untreated into the river. The absence of a sewerage system in Cagayan de Oro City is among the factors attributed to high levels of fecal coliform contamination of the river, which can be traced up to its drainage in the seawater of barangay Bonbon. It was reported that fecal coliform reached 248 most probable number (MPN) per 100 mL, higher than the 100 MPN/100 mL standard. The results have serious implications to the functions of the river system for the downstream communities of the city.



**FIGURE 9.** Quarrying Permit Grantees by MGB in Cagayan de Oro City

The EMB of Region 10 carried out water quality testing of the CDOR at four different locations in Cagayan de Oro City and the Bubunawan River in Pualas, Bukidnon on May 2019. Water quality analysis from 100 different groundwater sources, which include deep and shallow wells, dug wells, and free flowing wells was conducted to check if the water meet the National Standards for Drinking Water (NSDW) limit. Out of the 100 tested samples, 21, 40, and 28 exceeded the limits in Total Dissolved Solids (TDS), conductivity, and hardness, respectively.

As for surface water, under the DENR System of water classification, CDORB rivers were identified as “CLASS A,” in which treatment is required to meet the NSDW. Test results for different water quality parameters indicates that CDOR and Bubunawan River still meet the required standards for Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS) and pH. A 3°C increase in temperature was recorded from the sampled and tested waters, but still within the allowable limits, while turbidity is reported to be NS or not significant. However, very high fecal coliform values were found in the sampled water, indicating serious contamination. Most contaminated water was found in areas at Pelaez Bridge and Carmen Bridge. Fecal contamination may be attributed to animal manure disposal into the river from households with domestic animals and livestock, some households that have comfort rooms draining directly to the river, and informal settlers who improperly dispose human waste into the river.

The quality of available water in the CDORB diminishes with the wastewater. Municipal wastewater or sewage contains organic compounds and solids that have to be removed through sewage treatment (Loomis et al. 2000). In CDOC, absence of treatment infrastructure for sewage pollutes the water bodies into which it is discharged and could endanger public health and aquatic ecosystems. Unfortunately, the sewage also contains various urban wastes from gasoline stations, photo shops, laboratories, and small industries. These can contribute heavy metals and other toxic compounds that are not suitable for agriculture. A strategy must be developed for a win-win solution that avoids creating pollution while providing farmers with water.

Industry sectors could potentially use sufficiently treated sewage. Since sewage is discharged continuously throughout the year, wastewater is a reliable source of water for industry (Cristóvão et al. 2012). In many developed countries, industries collaborate with the local water agency to use partly treated sewage. The intersectoral impact is even greater where the effluent is discharged to the Macajalar Bay. Simply appropriating water from existing rural uses for transfer to cities and industries will cause rural resentment (Becken 2014). Fisheries and other aquatic ecosystems are particularly sensitive to water quality and can be seriously affected when industrial and municipal effluents are discharged into water bodies. The harm may travel up the food chain when other aquatic life or people eat the affected fish. Similarly, livestock require water for drinking and fodder, and milk is especially susceptible to poor quality water (Meinzen-dick and Appasamy 2000).



## Climate crisis and Anthropocene linkages

### Floodwater attenuation

The function of preventing the adverse effects of flooding is very important for humans. Watersheds can temporarily store large amounts of water during floods and mitigate the damage to agriculture and settlements. The watershed has the ability to store floodwater and gradually recharge, after the flood, thereby reducing the flood peak. This function is performed at an optimal level in ecosystems found in higher parts of the catchment, where the floods occur, and in watershed areas that are a recipient of torrential flow. The factors on which the efficiency of the function depends are: a) the type of wetland and the morphology of the catchment, b) the location and size of the catchment, c) a channel of water, d) water movement, and e) the vegetation cover (Konishi 2011; Mabao and Cabahug 2014; Zheng et al. 2008).

In the case of CDORB, this function is considered particularly important given the high degree of flooding vulnerability of communities along the river basin. Flooding in CDOR usually affects urban areas in the city. High flood risk communities in Cagayan de Oro are the island bars, old river channels/creeks, and former oxbow lakes such as Isla de Oro, an island community formed through accumulation of silt and sand; Isla Delta and Isla Bugnaw; portions of barangay Consolacion, Tibasak, Cala-cala, and Biasong; and riverbanks in barangay Kauswagan, Carmen, Macasandig, Balulang, Cabula, Mambuaya, and Dansolihon.

Based on statistics from the Philippine Astronomical, Geophysical and Atmospheric Services Administration (PAGASA), only six typhoons hit the entire island of Mindanao in the last fifteen years. CDOR experienced severe flooding in 2009, which displaced 5,684 families or over 30,000 people. In that year, according to PAGASA, the city received an amount of rainfall that was 142 percent above the normal average. According to the National Disaster Coordinating Council (NDCC) and field Report of the Regional Disaster Coordinating Council (RDCC) of Region 10, the total damage was placed at PHP 5.6 million.

To date, the most devastating typhoon occurred in 2011 when Tropical Storm Sendong (Washi) hit Mindanao, particularly CDOC, Iligan City, and other neighboring municipalities. The PAGASA weather station recorded 180.9 mm one-day rainfall, which exceeds the monthly average of only 117 mm. The maximum flood height was 7 to 9 meters in comparison to the normal height of the river. The Department of Public Works and Highways (DPWH) predicted that the return period for a flood event like TS Sendong is around 75 years, but the storm event that triggered it was categorized as

having a 20-year return period for its volume of rain. A year later, TS Pablo hit Northern Mindanao including Cagayan de Oro City. The recorded flood height in CDORB reached 7.65 m. This time, the effective utilization of early warning systems in the various communities along the CDORB resulted in zero casualties. Total estimated direct damages and losses due to the TS Sendong in Cagayan de Oro City was at PHP 3.6 billion (Table 2). This estimate does not include the value of the lives lost and the resulting losses in potential income as a result of the aftermath.

**TABLE 6.** Summary of Total Damages in all Sectors (in PHP)

SECTOR	DAMAGES	LOSSES	TOTAL
Housing	906,576,310.00	110,640,050.00	1,017,216,360.00
Education	56,535.00	–	56,535.00
Health	2,469,631.10	–	2,469,631.10
Infrastructure	1,872,072,000.00	55,990,000.00	1,928,062,000.00
Productive Sector	637,750,000.00	–	637,750,000.00
Tourism	17,780,000.00	315,000.00	18,095,000.00
Grand Total	3,436,704,476.10	166,945,050.00	3,603,649,526.10

Source: Data from National Disaster Coordinating Council (2009)

Understanding the different permutations and scenarios which could play out in CDORB is imperative to be better prepared in the future, according to a study by Mabao and Cabahug (2014). The results showed that the flood inundation of the Cagayan de Oro River is exposed to a high level of flooding hazard. The study also estimated that the river channel is only capable of handling two- or five-year storms without having considerable floodplain. It forecasted the high probability that the city will be flooded again with this category in the next five years. The study recommended that long-term mitigation measures have to be made upstream(Mabao and Cabahug 2014).

### *Droughts*

Of equal importance for consideration is the issue of drought contingencies. Droughts have been experienced in the city more frequently in the recent years: in 2015–2016, 2018, and 2019 (City Agriculture Office 2019). Groundwater is therefore likely to be overpumped during droughts to compensate for surface water deficiency. If the drought lasts for only one or two years, subsequent wetter years may largely replenish the losses in groundwater storage that result from the overpumping and diminished recharge during the drought. A series of drought years, however, may eventually lead to serious depletion of groundwater storage, with consequences for both short and long-term

water supply (CCAFS SEA 2016; Kiunsi 2013; Sun and Vose 2016). Because of the uncertainty of future droughts, and the unknown effect on water supply caused by possible climate change, it is important to consider the probability and effect of drought years.



### **Policy Recommendations for Meeting Urban Water Needs in the Anthropocene and the Implications on Forest Conservation in the CDORB**

#### **Ecosystem Services and Biodiversity**

Healthy watersheds provide an array of other ecosystem services such as increased biodiversity. Watersheds are vital in maintaining habitat for many of the world's plants and animals. They are home to 80 percent the world's terrestrial biodiversity, which includes complex webs of organisms that include plants and animals, as well as fungi and bacteria. Many of the species that live in forests cannot live anywhere else. Well-managed forests can restore and expand wildlife habitat that supports species threatened by climate change and development (Hilborn 2016; Lambert 2003; Luck, Chan, and Fay 2009; Lynch et al. 2016; Nguyen et al. 2016; Sauer et al. 2008; R. P. Tan et al. 2018).

On this basis it is assumed that there is richness of biodiversity at the CDORB. A survey on biological environment was carried out by the Protected Areas and Wildlife Bureau (PAWB) in 2013, which identified 82 species belonging to 38 different families of plants from the Kagay-an Bridge in barangay Nazareth to Pelaez Bridge in barangay Indahag. Mangrove forests developed along both banks of Cagayan de Oro River and a marshy area exist at the west side of the river mouth. Census surveys identified that a total of 27 species of wildlife vertebrates can be found in the project area, which is 12 km of river length from the river mouth. As for aquatic biota, 21 species of phytoplankton, 7 species of zooplankton, 5 species of macro-invertebrates, and 6 species of fish were identified in CDORB.

Another study on species richness and riparian vegetation along the downstream of Cagayan de Oro River revealed a total of 97 species belonging to 81 genera and 52 families. The study also revealed six threatened species both locally and nationally. Of these threatened species, 5 were considered

vulnerable, 1 endangered, and 4 endemic species. Majority of the plant species (63.3 percent) that were identified within the study area have economic value (Lubos et al. 2016).

The wide array of critical ecosystem services provided by healthy watersheds is frequently undervalued when making land use decisions. In the context of CDORB, Tan et al. (2018) conducted a study on the total economic valuation (TEV) of the CDORB for CDOC households in the downstream communities. The research employed the contingent valuation method (CVM), a survey-based approach to valuing non-market goods such as environmental goods and services. CDO households were asked in a contingent valuation survey of their willingness to pay (WTP) or contribute to watershed rehabilitation and preservation efforts to ensure the steady flow of ecosystem services from the CDORB. It was based on the notion that a well-protected watershed can provide security of water supply, fish supply, recreation, biodiversity, flood control, and increased resilience to extreme weather events to the general public, especially those in the downstream communities, which stand to benefit substantially.

A total sample of 963 respondents from the 80 barangays were asked in the CVM survey through face-to-face interviews with the household head or the member making expenditure decisions in the family. Systematic sampling procedure was employed in selecting the respondents in each barangay. The number of respondents in each barangay was set in proportion to the share of the barangay in the total CDO city population.

The non-parametric estimate of the mean WTP for the CDORB rehabilitation and preservation program is 12.19 percent to 17.58 percent of the water bill. The mean monthly water bill per household is PHP 531.80, which means that the WTP is equivalent to between PHP 63.72 and PHP 90.27. With a total household population of 137,465 in CDO (PSA 2010), the total value of the benefits (stable supply of good quality water, flood control, fishing and recreational value, biodiversity) that can be derived from the rehabilitation and preservation of the CDO River Basin would be between PHP 8,911,364.00–12,851,663.00 (USD 197,591.00–284,959.00) per month or PHP 106,936,365.00–154,219,960.00 (USD 2,371,094.00–3,419,511.00) per year.

The estimates of the various functions and values of the CDORB ecosystem can serve as the basis and justification for the contributions that may be potentially collected from different economic sectors and social groups benefiting from the CDORB's ecosystem services. Benefits derived by the different economic sectors from the CDO River Basin warrant the watershed's preservation activities.

### **Arguments for Pricing**

Water valuation aids policymakers in making both allocation as well as pricing decisions. Pricing of water is important not only for making optimal use of the resource, but also to ensure the financial sustainability of the water agency.

There is growing literature on the political economy of water pricing. Given the strain on public budgets, water agencies will face a difficult choice in the long run: either allow the infrastructure to deteriorate, or make the politically unpopular decision to price water efficiently for all sectors (Almaden 2014).

Households, especially those in the downstream communities, benefit from the CDORB ecosystem in terms of stable supply of good-quality water, flood control, food supply (fish and other seafood), recreation (white water rafting and other water sports activities in CDO River and Macajalar Bay), power supply, climate change mitigation, and biodiversity.

The National Water Resources Board (NWRB), an agency under DENR, is responsible for the administration and enforcement of the 1976 Water Code, which is the legal framework for Water Resource Management (WRM) in the country. NWRB's mandate ranges from regulation, conservation, and protection. It issues all permits for purposes of domestic, municipal, irrigation, power generation, fisheries, livestock raising, industrial, recreational, and other purposes.

NWRB requires one-time application and filing fees for water permits and imposes annual water charges on water permit holders classified according to the type of water use shown in Table 7. The fees are based on volume of water permits, that is, the granted discharge rate, not on actual rate of extraction.

**TABLE 7. NRWB Annual Water Charges Based on Volume of Water Permits**

CLASSIFICATION	BASE COST	WITHDRAWAL COST/LPS (IN PHP)			MORE THAN 50 LPS BUT NOT EXCEEDING 7,000 LPS	MORE THAN 7,000 LPS
		NOT MORE THAN 10 LPS	MORE THAN 10 LPS BUT NOT EXCEEDING 50 LPS	MORE THAN 50 LPS		
<b>a) Municipal</b>						
(1) Level I and II	500	6.60	10.20	13.20	16.80	
(2) Level III	5,000	6.60	10.20	13.20	16.80	
<b>b) Fisheries</b>						
	500	3.30	5.10	6.60	8.40	
<b>c) Livestock</b>						
	500	3.30	5.10	6.60	8.40	
<b>d) Irrigation</b>						
(1) Communal/Individual	500	3.30	5.10	6.60	8.40	
(2) National/Corporation	5,000	6.60	10.20	13.20	16.80	
<b>e) Power Generation</b>						
	5,000	3.30	5.10	6.60	8.40	
<b>f) Industrial</b>						
	5,000	12.30	18.95	24.55	30.55	
<b>g) Recreation</b>						
	5,000	12.30	18.95	24.55	30.55	

TABLE 7 (CONT'D)

h) Others	5,000	12.30	18.95	24.55	30.55
i) Charge for over extraction for non-critical areas		PHP 3,000 for every 1 lps or fraction thereof over-extracted			
j) Other Charges					
(j-1) Use of Water at its Natural Location for Fish Culture					
(j-1-a) For surface area < 15 has.		Base Cost of PHP 500 + PHP 110/ha			
(j-1-b) For surface area > 15 has.		Base Cost of PHP 500 + PHP 1,650 for 15 ha plus PHP 0.65/ha in excess of 15 ha			
k) Waterworks Supervision					
(k-1) Supervising/Regulation Fee		PHP 0.50 per PHP 100 capital stock subscribed or paid or if no shares have been issued, of the capital invested, or of the property and equipment, whichever is higher.			

As noted by the study of Palanca-Tan in 2011, groundwater abstraction has increased considerably over the last few decades in CDOC, many of which are undocumented. Groundwater development has thus taken place in an institutional setting that placed no or few limits on groundwater use. This may be attributed to the absence of a NWRB office in the region. To date, there is only one NWRB office in Mindanao—located in Davao City. As a result, the annual water charge is collected only from those who had applied for and been granted the water permit. The schedule of payment depends on the date the permit was granted. It is doubtful, given the very lean manpower base of NWRB and the distribution of permit holders all over the Philippines, that payments of annual water charges are adequately monitored.

Aside from granting of permits, efficient pricing of water consumption is equally as important since it defines the credibility and the quality of water supply as well as the possibility of developing new programs for the satisfaction of future quantitative and qualitative needs (Almaden 2014).

The NWRB water rate structure comprises two parts: the minimum charge and the commodity charge. The minimum charge is also known as service charge or demand charge. It should be able to cover all the fixed costs required to carry on the vital water supply functions not directly related to production and distribution. It ensures that there will be enough revenue to meet the utility's basic costs during periods of low water sales, such as when there is a drought.

The minimum charge should be within the ability of low-income users to pay for 10 m<sup>3</sup> of water. This volume is assumed to be enough for the basic

needs of a low-income user. The minimum charge should not exceed 5 percent of the family earnings of the low-income group in the municipality where the water utility operates.

The commodity charge is the amount to be charged for consumption beyond the minimum charge. This amount varies according to volume produced and consumer category. The quantity block method is being adapted as the method used to convert the determined revenue requirements into the tariff structure to be implemented. This supports NWRB's policy to promote conservation of water by providing for higher tariffs for higher consumption.

The Local Water Utilities Administration (LWUA) also has its own procedures for tariff determination which can be found in its Manual on Water Rates and Related Practices, revised in February 2000. The manual presents the fundamentals of the rate-making process and related practices and serves as a resource that the policymaker or manager may draw on to guide the analysis of the validity of rates and the basis on which they are founded.

Under the manual, water rates are set at amounts that ensure recovery of the cost of operating the water system services plus all maintenance costs considering the rate of inflation, and it is considered that they must be set at proper rational levels reflecting public services. It covers everyone from high-volume users to low-income earners, but it is necessary to set water rates that ensure fairness in considering low-income earners. At minimum water meter diameter supply connections of 13 mm, rates must not exceed 5 percent of the income of low-income groups within the water supply.

The CDOWD's water tariff rates were customarily determined by the following factors: cost of systems expansion, operation and maintenance costs, number of connectors, debt service needs of the water district, and operating efficiency. Water rates are implemented only after they are presented in a public hearing and after review and approval by LWUA. Water rates are also set through a socialized pricing scheme. Big water users such as industries and commercial establishments are charged higher rates which, in effect, subsidizes the smaller but more numerous water consumers. The CDOWD is currently implementing the existing water rates approved in 17 June 2011 per LWUA-BOT Resolution No. 84, which took effect on 01 May 2014 (Table 8).

As noted in the previous sections, a number of private firms which include large private service providers as well as small-scale independent providers (SSIPs) such as real estate developers and homeowners' associations in CDOC maintain their own water system, and as such, implement their own water tariff rates. Nonetheless, they follow relatively the same scheme as the CDOWD (Table 9).

In most cases, the water service providers in CDOC follow the direct cost pricing principle. In contrast, the ideal pricing scheme should follow the full-cost pricing approach which entails reflecting the marginal cost of extraction, delivery, and operation, and the environmental and user costs of water extraction and consumption. The efficiency condition also requires that

**TABLE 8.** Cagayan de Oro Water District Existing Water Rates

CLASSIFICATION	METER SIZE	MINIMUM CHARGE (PHP)	COMMODITY CHARGE			
			11–20 M <sup>3</sup>	21–30 M <sup>3</sup>	31–40 M <sup>3</sup>	≥ 41 M <sup>3</sup>
Residential/ Government	1/2"	218.40	30.55	31.85	33.65	36.00
	3/4"	349.40	30.55	31.85	33.65	36.00
	1"	698.85	30.55	31.85	33.65	36.00
	1 1/2"	1,747.20	30.55	31.85	33.65	36.00
	2"	4,368.00	30.55	31.85	33.65	36.00
	3"	7,862.40	30.55	31.85	33.65	36.00
	4"	15,724.80	30.55	31.85	33.65	36.00
	10"	60,278.40	30.55	31.85	33.65	36.00
Commercial/ Industrial	1/2"	436.80	61.10	63.70	67.30	72.00
	3/4"	698.80	61.10	63.70	67.30	72.00
	1"	1,397.70	61.10	63.70	67.30	72.00
	1 1/2"	3,494.40	61.10	63.70	67.30	72.00
	2"	8,736.00	61.10	63.70	67.30	72.00
	3"	15,724.80	61.10	63.70	67.30	72.00
	4"	31,449.60	61.10	63.70	67.30	72.00
	10"	120,556.80	61.10	63.70	67.30	72.00

**TABLE 9.** Water Rates in Selected Subdivisions in Cagayan de Oro City

RESIDENTIAL WATER RATES	MINIMUM CHARGE (10 M <sup>3</sup> )	RATE FOR EACH ADDITIONAL CONSUMPTION (PER M <sup>3</sup> )
High-rise Condominium	260	30.00
High-End Subdivision	275	28.90
High-End Subdivision	250	30.00

the marginal benefit from the use of the resource is equal across all sectors. However, in the case of tariff-setting in the Philippines, it was the base cost which was uniformly charged to all sectors.

A related charge is the environmental user fee based on the principle “let the polluter pay.” A fee must be imposed to users depending on the discharge of polluting effluents into the water body. Such a fee is levied in the Laguna Lake Development Authority area. The current approach to water pricing is inadequate for reflecting the true value of water. The fees charged by NWRB for either ground or surface water are grossly insufficient with regard to providing for cost recovery and sustainability of water resources (UNESCAP 2006).

### **Institutional Mechanisms**

Under the 1987 Constitution, all lands in the public domain belong to the State (Art. 7, Sec. 2). The overall jurisdiction and authority over forestlands, grazing lands, and forest reservations including watershed reservations were placed primary responsibility of the Department of Environment and Natural Resources (DENR) thru the Executive Order 192 of 1987.

The DENR is not only responsible for watershed management and water quality but also serves as the lead agency in promulgating the rules and regulations for the control of water, air, and land pollution and ambient and effluent standards for water and air quality. DENR also has an implementing agency called the River Basin Control Office (RBCO) which oversees the implementation, monitoring, and evaluation of DENR's programs and projects within the country's river basin. According to its website, “The RBCO, as lead government agency, rationalizes and integrates all national plans, projects, and programs within the country's river catchments basins, with the authority to serve as the oversight office of all various government agencies and corporations with relevant and related river basin initiatives, projects, and programs such as river basin infrastructure development, flood control, environmental protection, and integrated water resources management” (DENR-RBCO n.d.).

Within the CDORB, DENR also coordinates the preparation of the national development plans and investment programs for irrigation with another agency, the National Irrigation Administration (NIA) under the Department of Agriculture (DA), which is responsible for construction and management of irrigation systems. A related agency under DA is the Bureau of Soils and Water Management (BSWM), another national government agency mandated to help protect watersheds. One of BSWM's current watershed management programs is the generation of soil and water technologies that would make farming more productive, profitable, and ecologically sustainable. The National Power Corporation (NPC) is another agency which is given the management and control of the watershed within CDORB for its use. It has the responsibility of watershed protection, development, management, and rehabilitation.

At the local level, the Local Government Units (LGUs) under the Department of Interior and Local Government (DILG) by virtue of the Local Government Code of 1991 (Republic Act 7160) are mandated to implement local initiatives relating to environmental management, including watershed management. The DILG also assists the LGUs in supplying water to many small towns, in some cases with oversight from the LWUA, which finances and oversees autonomous Water Districts (WDs) whose board members are appointed by local mayors. It also provides technical advisory services, institutional support to LGUs and Water Service Providers (WSPs), and design standards for water supplied by water districts and other providers.

There are recently enacted laws that have placed jurisdiction in the CDORB area under different government agencies, which include the National Integrated Protected Areas System (NIPAS Act, RA 7586); the Philippine Mining Act (RA 7942), lodged primarily in the Mines and Geosciences Bureau of DENR; the Indigenous Peoples' Rights Act (RA 8371), and the National Commission on Indigenous Peoples (NCIP). There are currently more than thirty government institutions involved either in forests and water resource management or regulation, which is a main challenge to be addressed.

### **The Cagayan de Oro River Basin Management Council (CDORBMC)**

Created in 16 November 2010 during a Multi-Stakeholders Meeting and Workshop organized by the Archdiocese of Cagayan de Oro and the DENR, the Cagayan de Oro River Basin Management Council (CDORBMC) is a “multi-stakeholder group of [National] Government Agencies (NGAs), Local Government Units (LGUs), Non-Government Organizations (NGOs), private sectors, religious groups, People’s Organization/Indigenous People (PO/IP), Security and Academes that converge together to protect, preserve, rehabilitate and manage the watersheds, rivers, and forests” of the CDORB (Roa-Quiaoit 2019). The CDORBMC seeks to improve the quality of life of the stakeholders by upholding and implementing appropriate interventions to enhance better utilization of natural resources and to boost biodiversity along the watersheds and the rivers. It also encourages all other stakeholders to become part of the formulation of management plans and strategies for the river basin.

Currently, CDORBMC is being headed by a Board of Stakeholders (BOS), the decision-making body of the Council, and supported by an Executive Committee (ExeCom) and operated by the Project Management Office (PMO). There are six Technical Working Groups (TWGs), namely: Rehabilitation, Local Governance, Community Development, Resource Management, Payments for Ecosystem Services, and Media Camp and Communications.

Financially, the Council gets support from the NGAs members, in particular DENR 10, DILG 10 and MinDA. For almost a decade, it has also received substantial grants from the Government of The Netherlands through project supports from the International Union for the Conservation of Nature in Netherlands (IUCN-NL). One of its major projects was the implementation

of the river basin-wide Payments for Ecosystem Services (PES), socially marketed as VEST – Valuing Ecosystem Services Together, with indigenous peoples as sellers of the ecosystem services of providing water and controlling flooding to the downstream buyers in the urban city (Roa-Quiaoit 2019).

One of its unique features is its lens on the landscape-seascape continuum adapting the ridge, river, reef (R3 program) management is presently realized with the alliance of three existing management bodies in the entire landscape-seascape, namely, Macajalar Bay Development Alliance (MBDA), Cagayan de Oro River Basin Management Council (CDORBMC) and the Tagoloan River Basin Management Council (TRBMC). As of now, CDORBMC is overseeing the implementation of the Integrated River Basin Management and Development Master Plan (IRBMDMP) which was completed in 2014 for Cagayan de Or River Basin. (Roa-Quiaoit 2019).

The implementation of a river basin-wide PES on different modalities are implemented in partnership with both LGU and NGO-based groups (Talama Fund of Kitanglad Integerated NGOs, Sacred Compact of UniFrutti/Hineleban Foundation Inc.) (Roa-Quiaoit 2019).

River basin management councils are increasingly promoted because they are expected to improve resource management and enable participants to engage freely and equally in management. A number of studies noted three mechanisms by which participation enhances river basin management: 1) providing space for consensus building for better quality decisions, 2) mobilization of social capital for better quality decisions and implementation of strategies, and 3) raising the legitimacy of decisions to facilitate implementation of strategies (Almaden 2015; Brown et al. 1990; Chen et al. 2005; Lambert 2003; Wang et al. 2014). However, river basin management councils are also faced by several complexities associated with each of the mechanisms that add challenges to realizing the expectations of participation. They include consensus building and conflict in power relationships between participants; motivating participants that benefits from participation exceed the costs; and defining criteria for legitimate decision that satisfy all participants (Brown et al. 1990; Chen et al. 2005; Macharia, Thenya, and Ndiritu 2010; Rola and Francisco 2004; Sun and Vose 2016).

### **Tenurial Instruments for Forestland and Resource Management**

Security of tenure provides communities with an incentive to invest in sustainable management of their lands, waters, and other resources (Boquiren 2004). Forest tenurial instruments are used by governments to allocate public forests and forest lands to interested individuals, organizations, or entities and put these areas into sustainable management. The trend of forest tenure policies in the country has moved from resource extraction in the early years to the promotion of forest conservation in present times.

Different programs of DENR allow occupancy and tenure over areas within the CDORB. Tenurial instruments include the Community-based

Forest Management Agreement (CBFMA), Industrial Forest Management Agreement (IFMA), Socialized Industrial Forest Management Agreement (SIFMA), and Forest Land Grazing Management Agreement (FLGMA). Duration of tenure is 25 years, renewable for another 25 years. LGUs also award tenure over devolved areas.

Ancestral domain claims are the most dominant tenurial arrangement within the watershed area in CDOC. There are five upstream barangays in CDOC (Besigan, Dansolihon, Mambuaya, Tagpangi, and Tignapoloan) which are home to indigenous peoples greatly dependent on the watershed's water, fisheries, wildlife, timber, and non-timber products for sustenance and survival. This is followed by a CBFMA covering 212.93 ha and an FLGMA with a total area of about 117 ha.



## Conclusion

The review and analysis on the sustainability issues of the various downstream users in CDORB provides insights on how competing demands for water are likely to play out in different settings. Cagayan de Oro City's water-dependent sectors rely on a number of ecosystem services that are critical for sustaining its growth and expansion. The CDORB's ecosystem services as a whole are under serious threats in the Anthropocene. Freshwater availability and supply are increasingly unreliable due to pollution, depletion of groundwater, and increasing incidence of extreme weather events. Further, export of the costs of ecosystem service exploitation from the upstream and downstream areas of the basin have dire consequences not only for CDOC but for the entire region. Population growth and urbanization contribute directly to the decline of watershed hydrological services and the absence of a sewerage system adds to water pollution problems. Piecemeal reactions and responses do not work on undesirable disruptions in water supply, like the threats brought about by climate change and extreme weather events such as flooding and droughts.

There are pressing concerns in CDOC that must be urgently attended to. The Poblacion barangays of CDOC, which are home to 82 percent of its population, are faced with competing uses of water for domestic, municipal, industrial, and commercial purposes. Moreover, these are also areas where

major flooding in the city frequently occurs. Densification of economic activities may be cost-efficient for utility providers, but expanding productive activities in the area may put more stress on attaining environmental integrity.

The traditional result has been intersectoral competition over quantity and quality of water, but there are also possibilities for mutual gain. A closer look at types of water uses shows that domestic, agricultural, and industrial demands for water are all found in both rural and urban areas in different concentrations.

Demand management will also be necessary. A more rational system for raw water pricing that considers environmental, economic, and social costs and benefits should be instituted in order to achieve more efficient and equitable water resource allocation. It should provide the necessary incentives to the users in order to effectively utilize water resources and consequently to contribute to the achievement of the relevant environmental targets. A study on the total economic valuation of the CDORB has provided empirical evidence that CDOC residents have substantial willingness to pay, which can serve as basis and justification for instituting market-based contributions that may be potentially collected from different economic sectors and social groups benefiting from the CDORB's ecosystem services. It will also encourage different users to employ technologies and implement efficient water use practices. Water pricing, which has received considerable attention as a means of demand management, may not be very effective without complementary regulations, education campaigns, leak detection, retrofitting, recycling, and other technical improvements. The current status of groundwater depletion in CDOC may be controlled to a substantial extent by addressing inefficiencies in the LGU-operated system and the main water provider of the city, the CDOWD. The high transaction costs of monitoring illegal abstractors and collecting water charges from vast numbers of users is a critical issue.

In CDOC, appropriate response strategies for improving groundwater governance are still inadequate and this needs further attention in terms of filling information gaps, identifying solutions through exchange of experiences, and policy interventions. To better assess ecosystem services of the CDORB, future ecohydrological studies need to better account for the scaling effects of natural and anthropogenic stressors and other water supply and demand processes.

There are a number of challenges in dealing with transboundary water bodies governed by multiple agencies such as rivers and aquifers in today's hydrologic and political landscape, like the case of the CDORB. For the CDOC downstream community that shares the watershed with four other jurisdictions, it is vastly beneficial to come to a collaboration with various institutions that cross traditional political borders. Decision-makers need to identify the linkages between the watershed and people and be cognizant of the spatial and temporal relationship between ecosystem functions, services, and beneficiaries. Mapping areas for management interventions for ecosystem

services will help beneficiaries understand how they gain from the decisions, and—from a financing perspective—who might be willing to pay or need to be compensated for practice changes. There is a need to understand the full scope for trade-offs and externalities. Ecosystems are multifunctional and contribute to multiple ecosystem services in potentially conflicting ways. To avoid inconsistencies, there is a need to develop a conceptual map that shows the causal chain from forest management decisions to ecosystem services and benefits that accrue to different users. There is also a need to understand what incentives currently link ecosystem services to people and where there are policy gaps and opportunities.

In this Anthropocene epoch, an increased capacity to reflect on the actions of multiple users and determine how they can be changed is needed to secure economic and sustainable development in the CDORB.

## References

- Almaden, C. R. C. 2014. Protecting the Water Supply: The Philippine Experience. *Journal of Social, Political, and Economic Studies* 39 (4): 467–493.
- . 2015. Management Regimes of River Basin Organisations. *Environmental Policy and Law* 45 (3/4): 156–162.
- . 2017. A Case Study on the Socio-Economic Conditions of the Artisanal Fisheries in the Cagayan de Oro River. *International Journal of Social Ecology and Sustainable Development* 8 (2): 14–30. <https://doi.org/10.4018/IJSESD.2017040102>.
- . 2018. Ecotourism Policy Options for the White Water Rafting in Cagayan de Oro River, Philippines: A Multi-Criteria Analysis. *International Journal of Tourism Policy* 8 (2): 108–128. <https://doi.org/10.1504/IJTP.2018.092469>.
- Aromataris, E. and D. Riitano. 2014. Constructing a Search Strategy and Searching for Evidence. *Systematic Reviews* 114 (5): 49–56. <https://doi.org/10.1097/01.NAJ.0000446779.99522.f6>.
- ADB (Asian Development Bank). 2013. *Water Supply and Sanitation Sector Assessment, Strategy, and Road Map*. Manila: Asian Development Bank.
- Becken, S. 2014. Water Equity – Contrasting Tourism Water Use With That of the Local Community. *Water Resources and Industry* 7–8: 9–22. <https://doi.org/10.1016/j.wri.2014.09.002>.
- Boquiren, R. R. 2004. Rewards for Environmental Services in the Philippines Uplands: Constraints and Opportunities for Institutional Reform, 1–59. World Agroforestry (ICRAF). <https://www.worldagroforestry.org/publication/rewards-environmental-services-philippine-uplands-constraints-and-opportunities>.
- Brown, A., A. Dayal, and C. Rumbaitis Del Rio. 2012. From Practice to Theory: Emerging Lessons from Asia for Building Urban Climate Change Resilience. *Environment and Urbanization* 24 (2): 531–556. <https://doi.org/10.1177/0956247812456490>.
- Brown, T. C., B. L. Harding, and E. A. Payton. 1990. Marginal Economic Value of Streamflow: A Case Study for the Colorado River Basin. *Water Resources Research* 26 (12): 2845–2859. <https://doi.org/10.1029/WR026i012p02845>.
- Carr, G. 2015. Stakeholder and Public Participation in River Basin Management—An Introduction. *Wiley Interdisciplinary Reviews: Water* 2 (4): 393–405. <https://doi.org/10.1002/wat2.1086>.
- Cagayan de Oro City Agriculture Office. 2017. “Area of Crops Harvested in Cagayan de Oro City.”
- . 2019. City Agricultural Development Plan 2019–2022. City Government of Cagayan de Oro City. [https://cagayandeoro.gov.ph/phocadownloadpap/announcement/City\\_Agricultural\\_Development\\_Plan\\_2019\\_2022.pdf](https://cagayandeoro.gov.ph/phocadownloadpap/announcement/City_Agricultural_Development_Plan_2019_2022.pdf).
- CESM (Center for Environmental Studies and Management). 2014. “Formulation of an Integrated River Basin Management and Development Master Plan for Cagayan De Oro River Basin.” <https://faspselib.denor.gov.ph/sites/default/files//DOCUMENTS/cagayan%20de%20oro%20DRAFT%20MASTER%20PLAN.pdf>.
- CCAFS SEA (CGIAR Research Program on Climate Change, Agriculture and Food Security–Southeast Asia). 2016. Assessment Report: The Drought and Salinity Intrusion in the Mekong River Delta of Vietnam. 25–28 April. Ben Tre, Tra Vinh, Kien Giang, Vietnam. <https://hdl.handle.net/10568/75633>.
- CDOWD (Cagayan de Oro City Water District). 2015. Vulnerability Assessment, vol. 12.
- Chen, C. H., W. L. Liu, S. L. Liaw, and C. H. Yu. 2005. Development of a Dynamic Strategy Planning Theory and System for Sustainable River Basin Land Use Management. *Science of the Total Environment* 346 (1–3): 17–37. <https://doi.org/10.1016/j.scitotenv.2004.12.057>.
- Cities Development Initiative for Asia. 2013. Pre-Feasibility Study on Wastewater, Watershed & Solid Waste Management Cagayan de Oro City, Philippines. <https://www.fsmtoolbox.com/assets/pdf/198.pdf>.

- Clifton, J., and S. Foale. 2017. Extracting Ideology from Policy: Analysing the Social Construction of Conservation Priorities in the Coral Triangle Region. *Marine Policy* 82 (August): 189–196. <https://doi.org/10.1016/j.marpol.2017.03.018>
- Cristóvão, R., C. Botelho, R. Martins, and R. Boaventura. 2012. Pollution Prevention and Wastewater Treatment in fish Canning Industries of Northern Portugal. *International Proceedings of Chemical, Biological and Environmental Engineering* 32 (1): 12–16. <https://doi.org/10.7763/IPCBEE>.
- Dan Gavriletea, M. 2017. Environmental Impacts of Sand Exploitation. Analysis of Sand Market. *Sustainability (Switzerland)* 9 (7): 118. <https://doi.org/10.3390/su9071118>.
- DENR-RBCO (DENR-River Basin Control Office). n.d. “Power & Function.” <http://riverbasin.denr.gov.ph/main/index>.
- Dziegielewski, B. 2003. Strategies for Managing Water Demand. *University Council on Water Resources, Water Resources Update* 126: 29–39. <http://opensiu.lib.siu.edu/cgi/viewcontent.cgi?article=1110&context=jcwre>.
- Falkenmark, M., L. Wang-Erlandsson, and J. Rockström. 2019. Understanding of Water Resilience in the Anthropocene. *Journal of Hydrology X* (2): 100009. <https://doi.org/10.1016/j.hydroa.2018.100009>.
- Gleick, P. H., and M. Palaniappan. 2010. Peak Water Limits to Freshwater Withdrawal and Use. *Proceedings of the National Academy of Sciences of the United States of America*, 107 (25): 11155–11162. <https://doi.org/10.1073/pnas.1004812107>.
- Grimaldi, M., V. Pellecchia, and I. Fasolino. 2017. Urban Plan and Water Infrastructures Planning: A Methodology Based on Spatial ANP. *Sustainability (Switzerland)* 9 (5): 1–23. <https://doi.org/10.3390/su9050771>.
- Helweg, O. J. 2000. Water Supply and Groundwater Issues in Developing Countries. *Water International* 25 (1): 33–39. <https://doi.org/10.1080/02508060008686795>.
- Hilborn, R. (2016). Correlation and Causation in Fisheries and Watershed Management. *Fisheries* 41 (1): 18–25. <https://doi.org/10.1080/03632415.2016.1119600>.
- Israel, D. 2001. The Silent Dangers of Quarrying. *Philippine Institute of Development Studies Policy Notes* No. 2001-05. <http://dirp3.pids.gov.ph/ris/pdf/pidspn0105.pdf>
- JICA (Japan International Cooperation Agency). 2014. Special Assistance for Project Sustainability for Cagayan de Oro City Water District for Provincial Cities Water Supply Project Phase III: Final Report. [https://openjicareport.jica.go.jp/pdf/12182564\\_01.pdf](https://openjicareport.jica.go.jp/pdf/12182564_01.pdf).
- Joachim, O. I., N. Kamarudin, G. U. Aliagha, and K. J. Ufere. 2015. Theoretical Explanations of Environmental Motivations and Expectations of Clients on Green Building Demand and Investment. *IOP Conference Series: Earth and Environmental Science* 23 (012010). <https://doi.org/10.1088/1755-1315/23/1/012010>.
- Kiunsi, R. 2013. The Constraints on Climate Change Adaptation in a City With a Large Development Deficit: The Case of Dar es Salaam. *Environment and Urbanization* 25 (2): 321–337. <https://doi.org/10.1177/0956247813489617>.
- Konishi, T. 2011. Climate Change on the Vietnam, Mekong Delta Expected Impacts and Adaptations. Food and Agriculture Organization (FAO). [http://www.fao.org/fileadmin/templates/rome2007initiative/FAO\\_WB\\_TCIO\\_CC\\_Meeting\\_May\\_2011/TORUKO\\_1.pdf](http://www.fao.org/fileadmin/templates/rome2007initiative/FAO_WB_TCIO_CC_Meeting_May_2011/TORUKO_1.pdf).
- Lambert, A. 2003. Economic Valuation of Wetlands: An Important Component of Wetland Management Strategies at the River Basin Scale. Ramsar Convention Secretariat. UNEP/GEF South China Sea Project. [http://www.unepscs.org/Economic\\_Valuation\\_Training\\_Materials/06%20Readings%20on%20Economic%20Valuation%20of%20Coastal%20Habitats/07-Economic-Valuation-Wetlands-Management.pdf](http://www.unepscs.org/Economic_Valuation_Training_Materials/06%20Readings%20on%20Economic%20Valuation%20of%20Coastal%20Habitats/07-Economic-Valuation-Wetlands-Management.pdf).
- Leigh, N. G. and H. Lee. 2019. Sustainable and Resilient Urban Water Systems: The Role of Decentralization and Planning. *Sustainability (Switzerland)* 11 (3). <https://doi.org/10.3390/su11030918>.
- Li, Y. 2013. Analysis of Urban Water Use and Urban Consumptive Water Use in Nebraska – Case Study in the City of Lincoln, Grand Island and Sidney. MCRP thesis, University of

- Nebraska, 91. [https://digitalcommons.unl.edu/arch\\_crp\\_theses/22/](https://digitalcommons.unl.edu/arch_crp_theses/22/).
- Lieske, D. J. 2015. Coping With Climate Change: The Role of Spatial Decision Support Tools in Facilitating Community Adaptation. *Environmental Modelling and Software* 68: 98–109. <https://doi.org/10.1016/j.envsoft.2015.02.005>.
- Loomis, J., P. Kent, L. Strange, K. Fausch, and A. Covich. 2000. Measuring the Total Economic Value of Restoring Ecosystem Services in an Impaired River Basin: Results From a Contingent Valuation Survey. *Ecological Economics* 33 (1): 103–117. [https://doi.org/10.1016/S0921-8009\(99\)00131-7](https://doi.org/10.1016/S0921-8009(99)00131-7).
- Lubos, L. C., V. B. Amoroso, F. Coritico, and M. Demetillo. 2016. Species Richness and Riparian Vegetation of Plants in Cagayan de Oro River, Mindanao, Philippines. *Asian Journal of Biodiversity* 6 (2). <https://doi.org/10.7828/ajob.v7i1.839>.
- Luck, G. W., K. M. A. Chan, and J. P. Fay. 2009. Protecting Ecosystem Services and Biodiversity in the World's Watersheds. *Conservation Letters* 2 (4): 179–188. <https://doi.org/10.1111/j.1755-263x.2009.00064.x>.
- Lynch, A. J., S. J. Cooke, A. M. Deines, S. D. Bower, D. B. Bunnell, I. G. Cowx, V. M. Nguyen, J. Nohner, K. Phouthavong, B. Riley, M. W. Rogers, W. W. Taylor, W. Woelmer, S. J. Youn, and T. D. Beard. 2016. The Social, Economic, and Environmental Importance of Inland Fish and Fisheries. *Environmental Reviews* 24 (2): 115–121. <https://doi.org/10.1139/er-2015-0064>.
- Mabao, K. and R. G. Cabahug. 2014. Assessment and Analysis of the Floodplain of Cagayan De Oro River Basin. *Mindanao Journal of Science and Technology* 12, 147–170. <https://mjst.ustp.edu.ph/index.php/mjst/article/view/47>.
- Macharia, J. M., T. Thenya, and G. G. Ndiritu. 2010. Management of Highland Wetlands in Central Kenya: The Importance of Community Education, Awareness and Eco-Tourism in Biodiversity Conservation. *Biodiversity* 11 (July) : 85–90. <https://doi.org/10.1080/14888386.2010.9712652>.
- McGrane, S. J. (2016). Impacts of Urbanisation on Hydrological and Water Quality Dynamics, and Urban Water Management: A Review. *Hydrological Sciences Journal*, 61 (13): 2295–2311. <https://doi.org/10.1080/02626667.2015.1128084>.
- Meinzen-dick, R. and P. P. Appasamy. 2000. Urbanization and Intersectoral Competition for Water. *Urbanization and Water*, 27–51.
- Molle, F. and J. Berkoff. 2009. Cities vs. Agriculture: A Review of Intersectoral Water Re-Allocation. *Natural Resources Forum* 33 (1): 6–18. <https://doi.org/10.1111/j.1477-8947.2009.01204.x>.
- National Disaster Coordinating Council. 2009. Consolidated Report on the Effects of Flash Floods in Cagayan de Oro City, 9 February 2009.
- Nguyen, V. M., A. J. Lynch, N. Young, I. G. Cowx, T. D. Beard, W. W. Taylor, and S. J. Cooke. 2016. To Manage Inland Fisheries Is to Manage at the Social-Ecological Watershed Scale. *Journal of Environmental Management* 181 (October): 312–325. <https://doi.org/10.1016/j.jenvman.2016.06.045>.
- NWRB (National Water Resources Board). 2019. “Permitted Groundwater Extractions by User/Category.”
- Palanca-Tan, R. (2011). Designing a Raw Water Fee Scheme for Groundwater Extraction in Cagayan de Oro , Philippines. The Economy and Environment Program for Southeast Asia (EEPSEA). <https://archium.ateneo.edu/economics-faculty-pubs/104/>.
- Postel, S. L., and B. H. Thompson. 2005. Watershed Protection: Capturing the Benefits of Nature's Water Supply Services. *Natural Resources Forum* 29 (2): 98–108. <https://doi.org/10.1111/j.1477-8947.2005.00119.x>.
- PSA (Philippine Statistics Authority). 2010. Census of Population and Housing. [https://psa.gov.ph/sites/default/files/CAGAYAN%20DE%20ORO%20CITY\\_FINAL%20PDF.pdf](https://psa.gov.ph/sites/default/files/CAGAYAN%20DE%20ORO%20CITY_FINAL%20PDF.pdf).
- Ravanera, R. 2001. A Case Documentation ff the SARD Initiative Implemented by ANGOC in the Uplands of Dansolihon, Cagayan de Oro City, Philippines. Asian NGO Coalition

- for Agrarian Reform and Rural Development (ANGOC). <http://www.fao.org/tempref/docrep/fao/009/ag256e/ag256e00.pdf>.
- Roa-Quiaoit, H. A. 2019. "About Us." Cagayan de Oro River Basin Management Council. <https://www.cdorbmc.com/about-us/>.
- Rola, A. C., J. M. Pulhin, and A. H. Rosalie. 2018. Water Policy in the Philippines. *Global Issues in Water Policy* 8. [https://doi.org/https://doi.org/10.1007/978-3-319-70969-7](https://doi.org/10.1007/978-3-319-70969-7).
- Rola, A. and H. Francisco. 2004. Realities of Watershed Management in the Philippines: Synthesis of Case Studies. *Philippine Institute for Development Studies Discussion Paper Series* No. 2004-24 (July). <https://dirp3.pids.gov.ph/ris/dps/pidsdps0424.pdf>.
- Satterthwaite, D. 2011. How Urban Societies Can Adapt to Resource Shortage and Climate Change. *Philosophical Transactions. Series A, Mathematical, Physical, and Engineering Sciences* 369 (1942): 1762–1783. <https://doi.org/10.1098/rsta.2010.0350>.
- Sauer, T. J., R. B. Alexander, J. V. Brahana, and R. A. Smith. 2008. The Importance and Role of Watersheds in the Transport of Nitrogen. *Nitrogen in the Environment*, 203–240. <https://doi.org/10.1016/B978-0-12-374347-3.00008-1>.
- Shrestha, A., D. Roth, and D. Joshi. 2018. Flows of Change: Dynamic Water Rights and Water Access in Peri-Urban Kathmandu. *Ecology and Society* 23 (2): 42. <https://doi.org/10.5751/ES-10085-230242>.
- Sjödin, J., A. Zaeske, and J. Joyce. 2016. Pricing Instruments for Sustainable Water Management. Working Paper Nr. 28, *SIWI, Stockholm*, 13. <https://www.siwi.org/publications/pricing-instruments-for-sustainable-water-management/>.
- Stoker, P., H. Chang, E. Wentz, B. Crow-Miller, G. Jehle, and M. Bonnette. 2019. Building Water-Efficient Cities: A Comparative Analysis of How the Built Environment Influences Water Use in Four Western U.S. Cities. *Journal of the American Planning Association* 85 (4): 511–524. <https://doi.org/10.1080/01944363.2019.1638817>.
- Strzepek, K. and B. Boehlert. 2010. Competition for Water for the Food System. *Philosophical Transactions of the Royal Society B: Biological Sciences* 365 (1554): 2927–2940. <https://doi.org/10.1098/rstb.2010.0152>.
- Sun, G. and J. M. Vose. 2016. Forest Management Challenges for Sustaining Water Resources in the Anthropocene. *Forests* 7 (3): 1–13. <https://doi.org/10.3390/f7030068>.
- Tan, M. P. 2017. Sedimentation Dynamics of the Cagayan de Oro River Catchment and the Implications for its Coastal Marine Environments. PhD diss., The University of Notre Dame Australia. <https://researchonline.nd.edu.au/theses/165>.
- Tan, R. P., C. R. C. Almaden, M. K. D. Navarro, M. M. Obedencio, and C. L. R. Sereñas. 2018. Total Economic Value of the Cagayan de Oro River Basin. In *Innovation Addressing Climate Change Challenges*, edited by M. Hymel, K. Larry, J. Milne, and H. Ashiabor, vol. 1, 169–184. Cheltenham, UK: Edward Elgar Publishing Limited. <https://doi.org/10.4337/9781788973366>.
- UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific). 2006. "Good Practices on Strategic Planning and Management of Water Resources in Asia and the Pacific." Water Resources Series No. 85. <https://www.unescap.org/sites/default/files/Water%20Resources%20Series%20No85.pdf>.
- United Nations Environment Program (UNEP). 2014. Sand, Rarer than One Thinks. <https://wedocs.unep.org/handle/20.500.11822/8665>.
- UNWTO (World Tourism Organization). 2012. Global Report on City Tourism. AM Reports, vol. 6, 2–53. <https://www.unwto.org/archive/middle-east/publication/global-report-city-tourism>.
- Wang, Z., Y. Luo, M. Zhang, and J. Xia. 2014. Quantitative Evaluation of Sustainable Development and Eco-Environmental Carrying Capacity in Water-Deficient Regions: A Case Study in the Haihe River Basin, China. *Journal of Integrative Agriculture* 13 (1): 195–206. [https://doi.org/10.1016/S2095-3119\(13\)60423-2](https://doi.org/10.1016/S2095-3119(13)60423-2).
- Welcomme, R. L., I. G. Cowx, D. Coates, C. Béné, S. Funge-Smith, A. Halls, and K. Lorenzen. 2010. Inland Capture Fisheries. *Philosophical Transactions of the Royal Society B:*

- Biological Sciences* 365 (1554): 2881–2896. <https://doi.org/10.1098/rstb.2010.0168>.
- Zheng, B., J. Duan, J. Jia, F. Liu, and Y. Yan. 2008. Assessment of Ecosystem Services of Lugu Lake Watershed. *International Journal of Sustainable Development and World Ecology* 15 (1): 62–70. <https://doi.org/10.1080/13504500809469770>.
- Zomer, R. J., A. Trabucco, D. A. Bossio, and L. V. Verchot. 2008. Climate Change Mitigation: A Spatial Analysis of Global Land Suitability for Clean Development Mechanism Afforestation and Reforestation. *Agriculture, Ecosystems and Environment* 126 (1–2): 67–80. <https://doi.org/10.1016/j.agee.2008.01.014>.



# Conclusion

Antonio La Viña, Jose Andres Canivel, and Donna Paz Reyes

## Revisiting Perspectives on Forests in the Anthropocene

The diverse configurations of our forests across the archipelago are a treasure trove of life and wonder. It is a living natural heritage and beating landscape of our collective history, agency, and aspirations as peoples.

The historical purview and macro perspective presented in the first chapter proved foundational in unraveling the intersections between Philippine society and the story of our forests. Much can be learned from the documented customary forest practices of diverse indigenous peoples across the archipelago. Their wealth of traditional environmental knowledge, deep spirituality, and intimate culture-nature interactions attest to our society's inherent cultural ties with the forests, which have enabled both nature and communities to thrive for centuries. It reminds us of the quintessential value of our forests as a vital cradle of cultural identity, genetic diversity, and ecological life.

The legacy of colonial land laws and forest policies that reconfigured culture-based environmental worldviews and molded postcolonial forest regimes continue to make an indelible political-economic imprint to our forest landscapes and the status quo. Context discussions served as an eye-opener on how the drastic deforestation trend was brought by a combination of complex social and political-economic factors. The pervasiveness of dominant extractive orientation under global neoliberal policies have ushered the historic plunder of our forests in the interest of the ruling elite, bureaucrat cronies, and transnational corporations in the postcolonial period. Succeeding open-access phenomena of logged-over secondary forests brought by networks of logging roads crisscrossing mountainous regions prompted impoverished rural populations to convert forests for agricultural use. Though the peak of timber industrialization provided immediate income sources for impoverished upland farmers employed in sawmills and logging camps, in the long run it did not translate to inclusive social progress.

Drastic deforestation exacerbated the chronic crises of poverty, rural underdevelopment, and ills of social inequity. It was also a source of violent tensions and bitter conflicts as expanding logging areas resulted in

land grabs, economic displacement, and fragmentation of communities, particularly among forest-dependent indigenous peoples. It is a glaring irony that corporate logging and patronage politics through “legal logging” resulted in the historic demise of forests, yet smallholder swidden *kaingin* livelihoods and small-scale “carabao” logging were portrayed as the culprits of deforestation. Without sustainable forest management, forests and people suffer. The grassroots sector disproportionately bears the brunt of environmental injustices.

In the Philippines, reorientation towards community forestry and conservation was prompted by exacerbating rural underdevelopment and social inequities from denudation and the inevitable decline of the commercial logging industry. Socio-environmental movements and state reforms in the forestry sector ushered the implementation of social forestry programs and the installation of community-based forest management as the key national strategy in forestry. Aside from the objective to curb alarming deforestation trends, the programs were also meant to pacify consequent rural unrest born from oppressive elite regimes that have traditionally held the reigns of economic and political power from forest exploitation. With these reforms in tow, the forests served as a vital space of flourishing civil society involvement, the rise of community-led forest organizations, and multisectoral collaboration in forest conservation. These paradigm shifts in forestry served as institutional modes of espousing grassroots resource rights as well as an integral participatory rural development strategy.

These historical lessons attest that sustainable forest management is a vital pillar of nation-building. Genuine development, inclusive social progress, and good governance go hand-in-hand with verdant forests, teeming biodiversity, and thriving communities. Succeeding sector-based research and case studies meanwhile provided crucial ground perspectives to untangle the complex local histories and social context within diverse configurations of forest ecosystems and communities in the country.

The social network analysis in Chapter 2 highlights the feature of forest landscapes as complex terrains of uneven power relations, policy dynamics, and institutional interaction between diverse forest actors with distinct stakeholder’s resource interests, cultural orientation, and values. Mapping social networks within forest landscapes provide insights and understanding that can aid responsiveness of forest conservation programs, community participation, development strategies, and policy decisions. The study reminds us that development engagement with communities entails context understanding of institutional dynamics, local histories, and social narratives inherent within forest landscapes.

Meanwhile, the ethnographic inquiry on the lives of *bantay gubat* in Chapter 3 gave face to the often-obscured role of forest protectors. Their narratives trace a mosaic of ground experiences, meaning, and motivations which were virtually invisible in past research intention and literature.

Insights derived from the lived experiences of bantay gubat unveil the precariousness of their lives as environmental frontliners. The perseverance of the bantay gubat from diverse institutions and modest social backgrounds to perform their duty despite the meager pay, occupational hazards, and lack of recognition is a lesson in humility. It is likewise an eye-opener to the glaring gap in human resource development between ground actors, local practitioners, and policy decision-makers in the conservation and protection of forests. Their plight prompts us to enact stronger policy attention and institutional action to protect those who protect the forests.

Sustainability is indeed a perennial challenge as utilization of forest resources for food, fuel, timber, and non-timber resources becomes an economic lifeline for the majority of impoverished forest-dependent communities. Hence, there remains a pervasive perception among regulatory agencies that the current livelihood resource use of local communities is not in harmony with conservation. Yet this is not necessarily the case as evidenced by social-ecological analysis of traditional honey and abaca as forms of non-timber livelihoods in Chapter 4. Culture-based forest practices, traditional knowledge, ecological values, and institutional support are likewise vital in enhancing complementation rather than competition between livelihood and ecological outcomes.

Development trajectories and governance decisions of other sectors including agriculture, water, energy, and urbanization in a globalizing world continue to influence forest conservation policy and practice. Such is highlighted in exploring the policy nexus between the energy and forest sector in Chapter 5. The prevailing and dominant fossil-based energy system served as the building block of our current civilization along with the conveniences and maladies, as well as the progress and setbacks, that our modern society brings. The current global climate crisis beckons us once more to recalibrate our development pathways and advocate for a more ecologically sound energy system that will enhance carbon mitigation potentials and other ecological services of forests.

The last chapter highlights the pitfalls of myopic modernizing frames of development featuring unhampered industrialization, conventional agriculture, and the residential and urban build-up in downstream areas. Resulting development and environmental issues brought by watershed denudation, environmental pollution, water stress, and resource-based conflicts are exacerbated by climate change crisis impacts. More than ever, our regions across the archipelago suffer from the onslaught of super typhoons, prolonged drought, and flash floods with increasing intensity and frequency. Building resilience entails local government units pivoting to ecological system-based thinking and forest landscape perspective in their strategic development programs and a ridge-to-reef approach in natural resource management.

The case studies portray the perennial relevance and embedded role of our forest governance in national development and climate change crisis

responses. The cross-cutting challenges of forests in the Anthropocene beckons forest governance actors to move beyond business-as-usual attitudes and linear development outlooks. As a mega biodiversity and climate hotspot, our country has experienced and will continue to confront persisting forest biodiversity decline and worsening climate crisis impacts. Climate extremes featuring prolonged drought, super typhoons, biodiversity loss, soil degradation, and frequent incidents of flash floods as an aftermath of forest denudation have left impoverished rural communities most vulnerable. We as a nation need to realize the urgency of social action and institutional commitment in forest conservation to tap the climate mitigation potential and enhance ecosystem services of forests.

### Cultivating Pathways of Growth in Forest Conservation

The book illuminates key principles and core insights that resonate with the intertwined objectives of the Grow Forests, Grow Livelihoods, Grow Partnerships, and Grow Advocates aspects of conservation work by the Foundation and its partners.

First, to meet the objectives of enhancing forest ecosystems that provide products and services in Grow Forests, a deep understanding of both the social and ecological context is important. Growing forests is more than growing trees; it involves nurturing livable landscapes whose multiple ecological services enable both communities and biodiverse flora and fauna to thrive. Lessons from the ground affirm that instilling the tenets of community forestry is not a project-driven process, but a people-oriented one. As development facilitators, the Foundation along with its implementing partners should take into account local stakeholders' dynamics, local people-forest cultural interaction, and key development needs and aspirations. Grow Forests also involves social technology and policy strategies in fostering institutional relations, progressive leadership, local organizational commitment, and ecological values among rain-forestation communities and conservation partners. In response to science-based and socially oriented conservation, promoting the tenets of integrated natural resource and environmental management, as well as integration of climate change mitigation, adaptation, and resilience objectives in forest landscape approaches are vital in broadening the strategic purview of the Foundation's conservation program.

Second, supporting development of sustainable livelihoods, consistent with the manner of protecting the forests in Grow Livelihoods entails a strategic and holistic community development perspective. Grow Livelihoods should not just account for quantitative economic parameters, but also the qualitative improvement to the cultural well-being and political development of forest communities. These include recognition and promotion of forest resource rights, tenure security, and traditional knowledge and customary

practices, among others. Enhancing viability of forest livelihood also entails building resilience and enhancing climate mitigation and adaptation potentials wherein relatively non-extractive non-timber forest livelihoods that protect carbon sinks are not only supported but also accrue incentive mechanisms. Responsive conservation-based forest livelihoods also include techno-financial support and promotion of fair-trade relations to break the chains of debt and market exploitation that plague the rural uplands. Fair trade and equitable market relations not only garner higher product prices and discourage unsustainable forest harvests and practices, but also provide locals with the just share of their labor and a dignified recognition of their role as forest actors. Meanwhile, the pandemic crisis presents an avenue to integrate food security, nutrition, health, and well-being as strategic relevant objectives in forest livelihood programs.

Third, facilitating organizational development, network linkages, and institutional collaboration in Grow Partnerships reminds us to revisit policy attention, development approaches, and institutional support for frontliners in forest conservation. The status, role, and well-being of local community actors who are most directly and closely in touch with forests, including forest guards, indigenous peoples organizations, and forest-dependent communities deserve more than just a footnote in the discourses and directives of forestry programs. The proposed promotion of integrated natural resource management approaches can further strengthen and consolidate the ongoing multidimensional responses that feature multisectoral collaborative actions and science-based responses across scales in forest conservation. Inclusive frameworks and approaches may further enhance cultural sensitivity, gender responsiveness, and inclusivity for differently-abled peoples to ensure a broader and a more inclusive partnership across sectors. Collaboration with artists, writers, and story-tellers will prove vital in communicating the robust historical lessons and conservation narratives derived from the book in a creative and publicly accessible medium. Likewise, the pressing climate, biodiversity, food security, and pandemic challenges in the Anthropocene highlights the imperative to integrate forest conservation in policy mechanisms and strategic development plans from various sectors: from agriculture to energy; urban centers to rural peripheries; and the community to national levels. Addressing these entails strengthening collaborative partnerships with academic bodies as well as local community experts and practitioners across multiple natural, social, and physical scientific disciplines.

Fourth, enhancing knowledge and expanding initiatives in Grow Advocates highlights the role of science, research, and communication in sharing perspectives from the forestry sector in the Anthropocene. Creative and artistic mediums are essential to communicate academic discussions and technical scientific resources for forest conservation stakeholders. Tapping both traditional and social media are vital in ensuring that conservation science and community experiences are made accessible to the public, usable

by forest conservation actors and translated for policy development. There is also a need to consolidate and engage networks of diverse advocates to serve as support groups in lobbying for more progressive forest statutes and policy development. Organizing collaborative endeavors between the Foundation, forest communities, and conservation advocates will also serve as avenues in facilitating effective and creative communication of conservation programs and policy education.

Fifth, ground realities, grassroots narratives, and research findings highlight the precarious situation of environmental defenders and conservation frontliners. Ongoing resource-based conflicts, escalating rural violence, skewed power dynamics, and crises in human rights are palpable threats to the lives, dignity, and development of communities in forest conservation. These serve as sociopolitical barriers that undermine the potentials of local government units, forest-dependent communities, forest guards, indigenous peoples, and civil society organizations to successfully carry out work in forest protection and conservation. Further, the evolving pandemic crisis has added layers of conservation challenges, including the resurgence of the elite capture of natural resources and difficulty in monitoring extractive activities amid the limited mobility of conservation frontliners and diverted attention of policy enforcers. There is also small-holder resource exploitation and increasing unsustainable forest practices brought by deepening economic decline and poverty pressure experienced by forest-dependent communities. This conjuncture of crisis unveils another layer of vulnerability experienced by conservation actors, as well as exacerbates the preexisting conservation challenges. Such also warrants another layer of policy scrutiny and political discourse in our environmental and development work to ensure that the rights, well-being, and dignity of environmental frontliners are safeguarded. It is an imperative that human rights, environmental justice, and rights-based approaches be institutionalized as fundamental objectives and program strategies in all our forest conservation and ecological restoration endeavors.

### **Reaffirming Commitment to Forests in a New Decade of Ecological Restoration**

This book is akin to a tree within a forest. True to the age-old wisdom of our ancestors, nature is the best teacher. There is much to learn from the forests, as there is much to be done for the forests. Numerous tangents of understanding can be explored to broaden our perspectives about forest ecosystems and the Philippine society in this era of anthropogenic climate crisis. What is the forest to the farmers, workers, youth, artists, scientists, engineers and educators, and other people from different walks of life? How do the politics of land rights, gender, and justice unfold in forest and biodiversity conservation? What are the dynamics of indigenous customary forests within state-led

forest policies? How do we situate the forest in the emerging discourse and controversial debates regarding technology and artificial intelligence? The COVID-19 pandemic crisis beckons us to ponder: What are the intersections of forest and health in the current pandemic scenario? How did forest conservation programs, community projects, and scientific research fare and adapt during the community quarantines? How can the forest be made accessible as a safe space, the succor of well-being, source of creativity, and space for communion in this time of growing isolation and social distancing? How can we collaborate to counter the currents of forest biodiversity loss and ecological collapse? How can we promote a more progressive socio-ecological consciousness with communion rather dominion in a multispecies world?

The list goes on as we explore the evolving intricacies of our relationship with forests in this age of the Anthropocene. May our ponderings stoke our creativity, imagination, and unwavering faith in the potentials of our people. Everywhere there are pockets of hope and rays of inspiration as Filipinos collectively carry the mantle of being both stakeholders and duty-bearers of forest conservation. Rather than be stifled with grim environmental realities and overwhelming tasks, we must also recognize the milestones, continuing actions, and innovations in conservation. Our local forest narratives show that change is possible as we work toward the realization and institutionalization of our forest conservation policies and practices. Amid the heavy realities of structural, governance, and institutional challenges, conservation experiences from the ground are the beating heart of the hope to rise from the pitfalls of history and reinvigorate outlooks toward forest conservation and rehabilitation. Together, our hands cannot just plant seeds, but also grow forests of possibilities as we carry on cultivating progressive pathways as peoples for forests and future.

The Foundation encourages all to face the new decade with renewed vigor and vision as we further strengthen and forge synergies among civil society, scientific bodies, and grassroots communities to bring forth concrete contributions in the UN Decade on Ecosystem Restoration (2021 through 2030) to prevent and halt denudation while consolidating efforts to restore degraded ecosystems, particularly the rainforests, mangroves, and peatlands, among others. May this book bring forth critical reflections to serve as guideposts in reaffirming our commitment, creative potentials, and common responsibility in the Anthropocene to conserve, protect, and rehabilitate the forests, and reconcile our bonds with nature in the process.

# About the Contributors

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