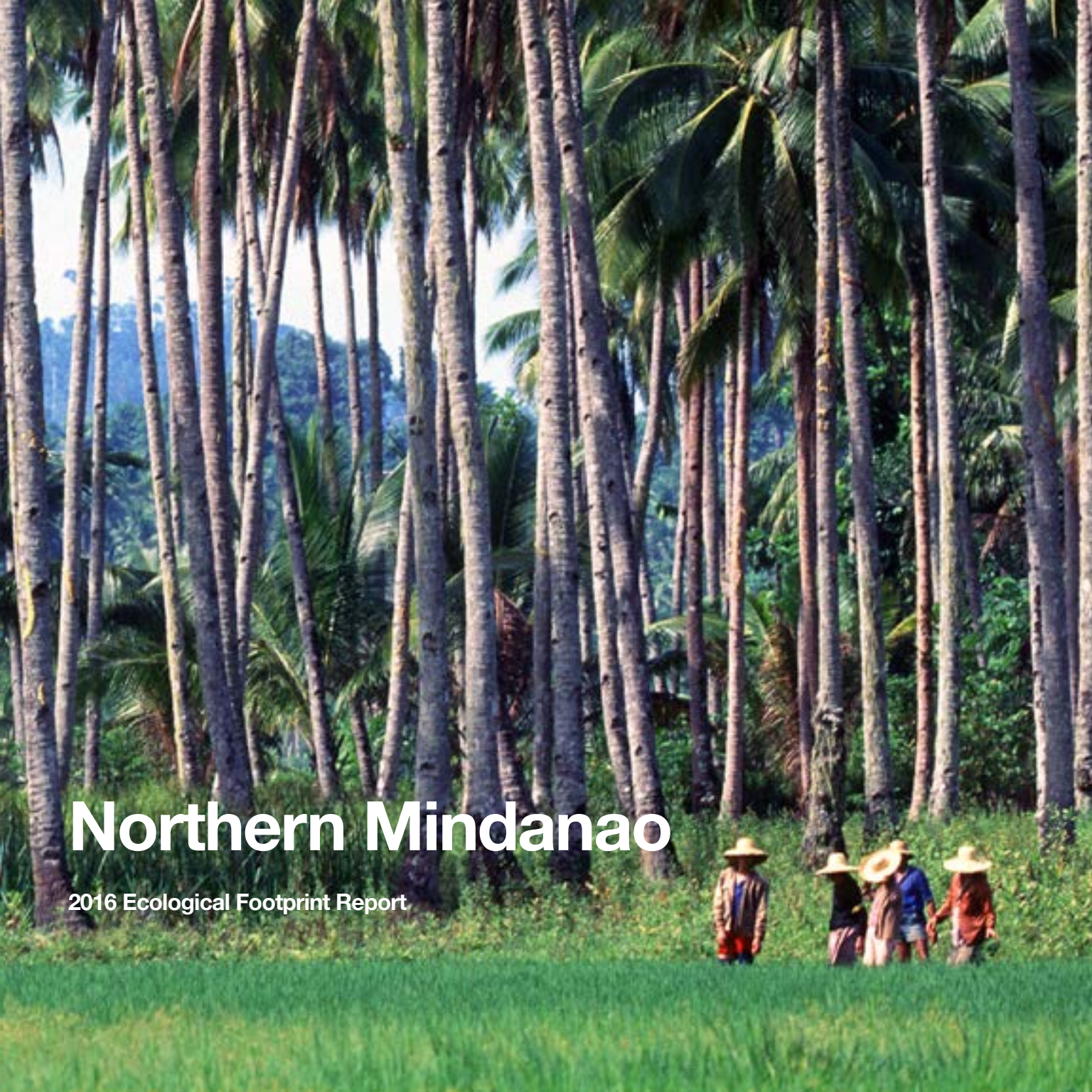

Northern Mindanao

2016 Ecological Footprint Report

The designations employed and the presentation of materials in the Ecological Footprint and biocapacity analysis do not imply the expression of any opinion whatsoever on the part of Global Footprint Network or its partner organizations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

For further information, please contact:

Global Footprint Network

426 17th Street, Suite 700
Oakland, California 94612 USA

+1.510.839.8879

www.footprintnetwork.org

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Executive Summary

In 2015, Global Footprint Network collaborated with the Philipine government and the Agence Française de Développement (AFD) to undertake a study of the Nothern Mindanao/Bukidnon river basin region to understand the benefits of integrating Ecological Footprint and biocapacity frameworks into climate resilient land use and local development planning. This effort suported AFD's Renaissance Project activities by providing scientific data that provided context and guidance for specific interventions.

Snapshot of Findings—Bukidnon

Finding: Since 1970, the Philipines' per person Ecological Footprint has risen only slightly, while at the same time the country has made steady gains in its Human Development Index score.

Insight: While the Human Development Index shows that the average resident has achieved higher levels of development, the Philipines' Gini coefficient—an indicator of income disparity—is the highest of counties in Southeast Asia. Average measures of development may not reflect segments of the population that do not have access to resources requited to meet basic needs such as food, shelter, health, and sanitation.

Finding: Residents of Bukidnon have the smallest Footprint per person among all the provinces of the Mindanao (about 0.61 gha per person).

Insight: People in Bukidnon likely do not have the access to sufficient materials to meet basic needs, including food and shelter.

Finding: The Philipines overall has a very small amount of available resources within its borders (only 0.54 gha available per person).

Insight: The Philippines must rely on importing goods to sustain the activities and livelihoods of the people who live in the country—even those in Bukidnon with the smallest Footprints.

Finding: Cropland area in Bukidnon has expanded by almost 30%, resulting in a 17% increase in cropland biocapacity since 2000.

Insight: Forest land biocapacity steadily decreasing while cropland biocapacity in-creases reveals some shifting of Footprint and biocapacity via land conversion.

Finding: The largest proportion of the region's Ecological Footprint of consumption is food.

Insight: Conversion of forest lands to croplands may, in the short term, increase food production to meet demand. However, as population continues to grow in the region, the conversion of cropland into residential, industrial and commercial areas adds an additional challenge to sustainably managing sufficient cropland for food security.

Using the Ecological Footprint Policy and Planning

National governments currently using the Ecological Footprint are able to, 1) Assess the value of their country's ecological assets, 2) Monitor and manage their assets, 3) Identify the risks associated with ecological deficits, and 4) Use data to inform and benchmark policy. The findings in this report, and continued application of the Footprint can be used to support Forest Land Use Planning, Comprehensive Land Use Planning, and Comprehensive Development Planning in the Philippines. Awareness of biocapacity and consumption trends provides holistic and long-term views in the management and governance of ecosystems.

Forest Land Use Planning

Ecological Footprint and biocapacity trends assess forest area, forest productivity, and forest product use. The broader situational outlook of declines in forest biocapacity helps identify specific risks and opportunities to better position Renaissance Project interventions for success.

Comprehensive Land Use Planning

The Comprehensive Land Use Plan (CLUP) is a development plan that contains specific proposals to guide and regulate growth of a city or municipality. Detailed Ecological Footprint data from the Consumption Land Use Matrix (CLUM) identify the largest consumption categories for the region and the land uses required to provide those resources. Identification of these categories, coupled with other social and economic context, provides insight into the drivers of consumption, and can inform comprehensive land use planning by highlighting gaps between available biocapacity and the resource metabolism of the region.

Comprehensive Development Planning

A key component of CDP is the Environmental Management Plan, which consolidates the environmental consequences of all development proposals within the municipality, with the end goal of providing mitigating and preventive interventions to anticipate their adverse impacts to the environment. In addition, the CDP requires the study of the various demands and pressures on a given ecosystem. Current Ecological Footprint and biocapacity assessments show that resource use in the region exceeds that which the land is able to provide without trade. Thus, Ecological Footprint can help identify which issues need to be addressed most urgently from a broad perspective.

Renaissance Project Interventions

As stipulated in the Project Renaissance feasibility study prepared by Oréade-Brèche in March 2015, two key factors in achieving Renaissance's sustainability goals are greater long-term vision, and increased involvement of, and leadership from, local communities. Ecological Footprint science provides important data concerning these two factors. Comprehensive Ecological Footprint time trends completed for this report not only show the stark reality of ecological resource use from 1961—2012 but also offer insight into what the resource situation will be under business as usual operations. And, as noted in the findings above, the Footprint reveals that Bukidnon residents do not have access to sufficient materials to meet basic needs. Involvement of local communities in Renaissance sustainability efforts can help address the issue.

Introduction

Global Footprint Network and the Philippine Government, through the Climate Change Commission of the Philippines, launched a partnership in 2012 to complete Phase 1 of a National Footprint Project for the Philippines (funded by Agency Française de Développement – AFD), and in 2013 completed Phase 2 of the project, a sub-regional Footprint Project for the Laguna Lake region. Phase 2 was completed in partnership with the Laguna Lake Development Authority (LLDA) and the Office of the Presidential Adviser for Environmental Protection (OPAEP) and was funded by the Australian government through AusAID.

The results of Phases 1 and 2—disseminated in two reports, one on the National Philippines Footprint and one on the Laguna Lake region—present a sharp picture of the Philippines' national and regional historical consumption trends and current natural resource situation—information that has become critical for making sustainable and resilient policy and planning decisions at the highest levels of government. Since producing these reports, Global Footprint Network has continued conversations with provincial and regional government organizations in the Philippines to complete focused studies in the province of Palawan with Philippine Council for Sustainable Development, in the Mindanao region in coordination with the United Nations Environmental Programme (UNEP) and the Mindanao Development Authority (MINDA), particularly the river basin, as well as an overall regional study, and with WWF Philippines, to understand the ecological impact of private sector industry throughout the country. Global Footprint Network's relationships with stakeholders in the Philippine government at both the national and provincial levels, and Global Footprint Network's understanding of current local and national plans to prioritize sustainable development, increase resilience to disasters, and address the economic implications of climate change lay a strong foundation for working with officials in the province of Bukidnon on sustainability frameworks implementation and policy applications.

Once again, Global Footprint Network has partnered with the Agence Française de Développement to complete a Footprint study of Northern Mindanao.

The primary objective for this project is to conduct a baseline Ecological Footprint and biocapacity analysis of Northern Mindanao in order to:

1. Inform future policies in Northern Mindanao by identifying critical ecological pressures and drivers and how they measure against availability of ecological assets;
2. Supply Footprint and biocapacity data, analysis and information to policymakers to strengthen sustainability regulation efforts and guide effective development efforts;
3. Apply Ecological Footprint and biocapacity frameworks to pilot cases in Mindanao focused on infrastructure, land-use or growth scenarios that address aims of the proposed "Reviving Ecosystems Nature and Agriculture by Implementing Sustainable Solutions And Community Empowerment" (Renaissance) Project; and
4. Partner with local agencies/government units, NGOs and academia that are using complementary indicators and frameworks and share knowledge and best practices to support the integration of these tools in relevant policy, planning and project-level decision frameworks at the national and subnational level.

Introduction

The Phillipines has robust plans to prioritize sustainable development goals

Nothern Mindanao, and Bukidnon Province specifically, are focus areas

Global Footprint Network's Ecological Footprint metrics provide scientific foundation for regulation efforts

Throughout the report, look for the footprint for key points in each section

Key Analyses

- Ecological Footprint and biocapacity for Northern Mindanao, with additional Footprint and biocapacity data on the Philippines, Mindanao and Bukidnon
- Final resource consumption patterns for Northern Mindanao
- Forest land and cropland biocapacity time trends for Northern Mindanao 2000-2012
- Links between Ecological Footprint, biocapacity and human development (HDI)

Together, these three studies offer a comprehensive look at the ecological state of the Philippines from a variety of perspectives: national, subnational and local. Starting from a wide focus, the first study gave an introduction to the methodology and concept of resource accounting, while breaking down the Ecological Footprint of the Philippines by the various land types. The second study showed the scalability of the Footprint tool, focusing on the Laguna Lake area, home to Metro Manila, and offering comparable data from the subnational to the national level for context.

Lastly, this third study offers data and analysis on Northern Mindanao, an area rich in biocapacity that is now facing rapid growth and development. Beyond scale, each study offers analysis from different types of places—from the nation as a whole, to its urban core, to an area that the country is greatly dependent on for biocapacity. Each perspective helps illuminate the risks and opportunities that come with current resource consumption patterns and helps inform and benchmark policy and investment decisions.

Key Analyses

The Ecological Footprint mesures the amount of natural resources being used, and the amount available

Ecological Footprint of the Philippines, Northern Mindanao, and Bukidnon are compared

Cropland and forest land are highlighted in this report

Consumption patterns revealed in the Footprint can be linked to human development

The Concepts of Ecological Footprint

Ecological Footprint, Biocapacity and Overshoot

Just as a bank statement tracks expenditures against income, Ecological Footprint accounting measures a population's demand for and ecosystems' supply of ecological assets.

On the supply side, a city, state or nation's biocapacity represents the productivity of its ecological assets (including forest lands, grazing lands, cropland, fishing grounds and built-up land).

HOW THE ECOLOGICAL FOOTPRINT IS CALCULATED

$$EF_C = EF_P + (EF_I - EF_E)$$

Ecological Footprint of Consumption

EFp does not give an accurate indication of the quantity of resources consumed nationally, which are directly related to domestic well-being. In order to assess domestic consumption of a population we use the Ecological Footprint of consumption (EFc). EFc accounts for both the export of national resources, and the import of resources used for domestic consumption. EFc is most amenable to change by individuals through changes in their consumption behavior.

The Ecological Footprint of consumption indicates the consumption of biocapacity by a country's inhabitants.

Ecological Footprint of Production

The sum of all human demand placed for the resources from cropland, grazing land, fishing grounds, forests, and built-up land, plus the carbon dioxide emitted, within a country's borders comprise the Ecological Footprint of production (EFp). This measure mirrors the gross domestic product (GDP), which represents the sum of the values of all goods and services produced within a country's borders.

The Ecological Footprint of production indicates the consumption of biocapacity resulting from domestic production processes.

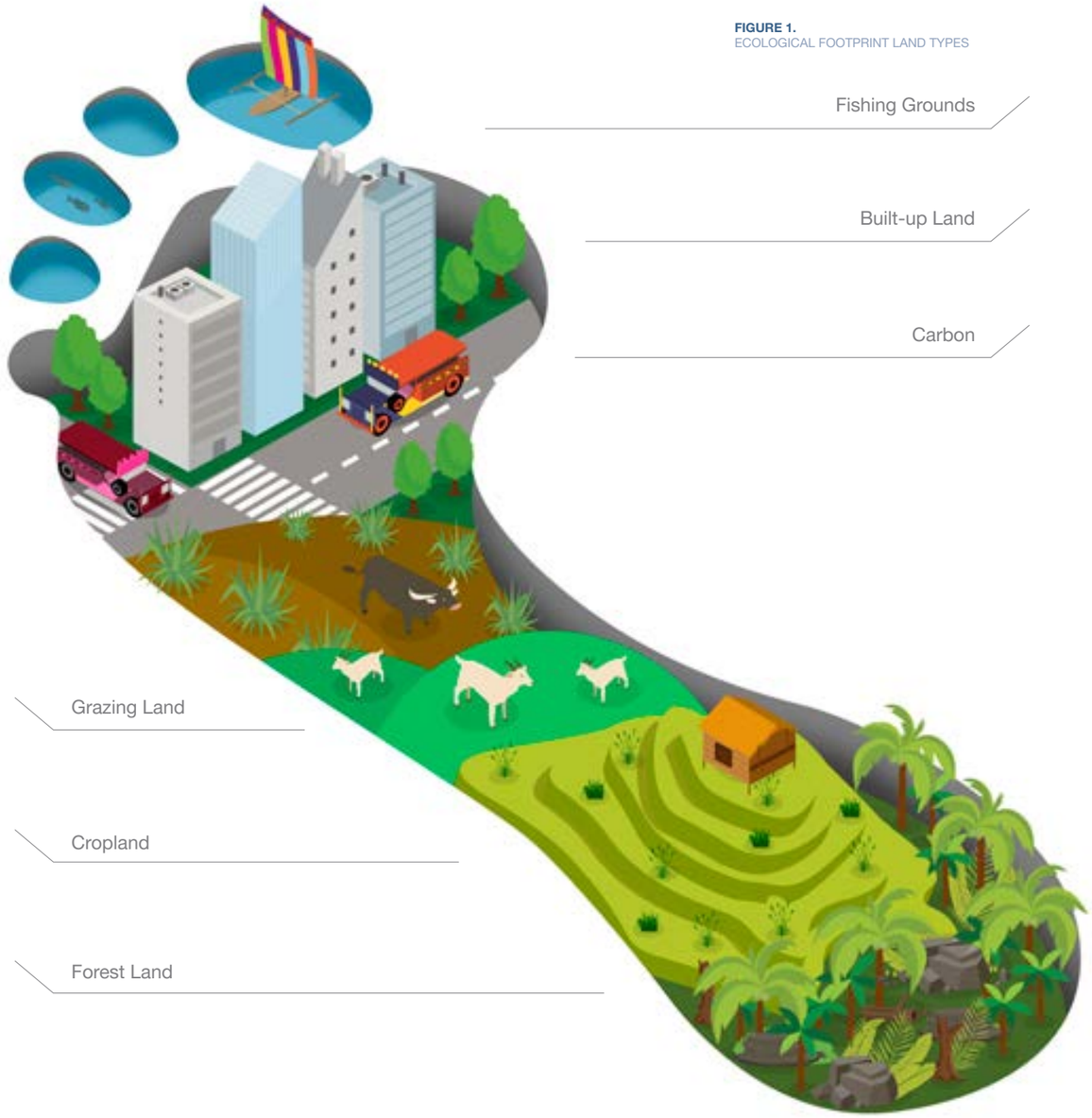
The demands placed on the environment by a country through the emission of carbon dioxide are mostly dispersed throughout the globe. Therefore, if we wish to look specifically at impacts of direct resource harvest on the domestic environment the carbon Footprint component should be excluded from the calculation (EFp-carb). The Ecological Footprint of production excluding carbon measures a country's direct harvest of its own biocapacity.

Net Ecological Footprint of Trade

Embodied in trade between countries is a use of biocapacity, the net Ecological Footprint of trade (the Ecological Footprint of imports minus the Ecological Footprint of exports). If the Ecological Footprint embodied in exports is high, the resources used to support this trade have the potential to reduce the domestically available biocapacity. If the Ecological Footprint embodied in imports is high, then there is an indiction that the country may be very susceptible to global resource constraints.

The Ecological Footprint of exports and imports indicate the use of biocapacity within international trade.

FIGURE 1.
ECOLOGICAL FOOTPRINT LAND TYPES



On the demand side, the Ecological Footprint measures the ecological assets that a given population requires to produce the natural resources and services it consumes (including plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure, and forest to absorb its carbon dioxide emissions from fossil fuels).

Both measures are expressed in global hectares—globally comparable, standardized hectares with world average productivity.

Each city, state or nation's Ecological Footprint can be compared to its biocapacity. If a population's Ecological Footprint exceeds the region's biocapacity, that region runs an ecological deficit. A region in ecological deficit meets demand by importing, liquidating its own ecological assets (such as overfishing), and/or emitting carbon dioxide into the atmosphere.

Why it Matters

The Ecological Footprint accounting helps leaders understand their country's consumption patterns

Governments can use information on available resources to plan infrastructure

Used with the UN's Human Development Index, the Ecological Footprint shows a country's sustainable development position

Economies are intimately linked with the natural resources, so long term sustaibability relies on the steady natural resource management

Why It Matters

National Policy and Decision Making:

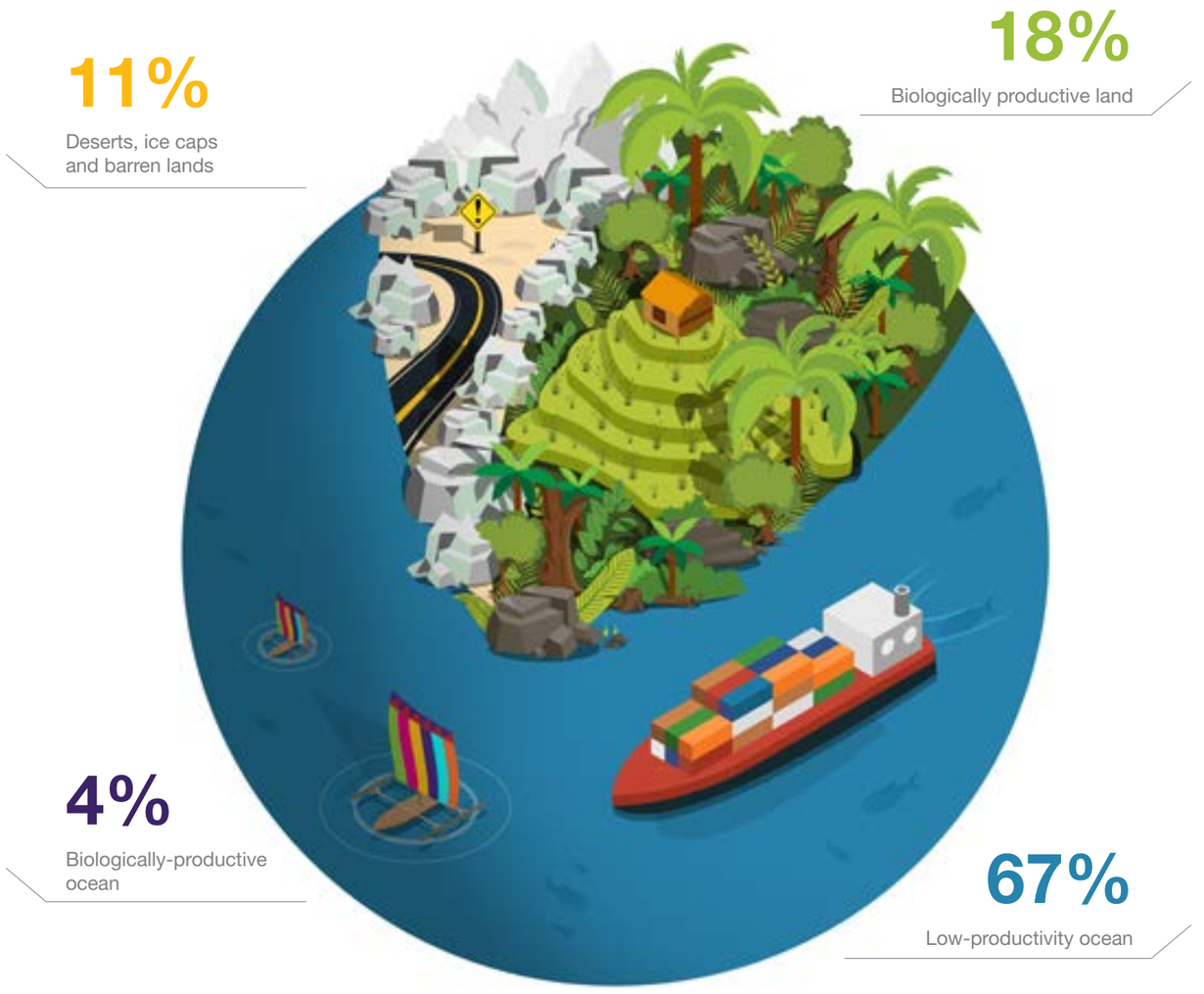
The Ecological Footprint enables national governments to measure and manage their country's ecological assets. By identifying risks associated with ecological deficits, Ecological Footprint accounting helps decision-makers set policy that safeguards resources and enhances economic prosperity.

The foundation of all Ecological Footprint accounting at the national level is based on our National Footprint Accounts, which track human demand on nature and our planet's capacity to meet that demand for more than 200 nations. The Footprint Accounts use more than 15,000 data points per country per year.

Regional and Provincial Governments:

Cities that make investments to improve the well-being of their citizens while maintaining or even expanding their natural capital will be more resilient amid growing resource constraints. Understanding these resource limits and basing policies and investments within them enable local and regional leaders to make fiscally responsible, sustainable investments for a prosperous future. Local decisions on issues such as infrastructure and transportation have the potential to impact resource consumption patterns of that area's population for generations, and can thus impact the Footprint of the nation and region. Communities and city planners around the globe use our tools to guide land use and budget decisions, track sustainability progress, and support better sustainability policy and actions.

FIGURE 2.
BIOLOGICALLY PRODUCTIVE AND LOW-PRODUCTIVE AREAS



Human Development:

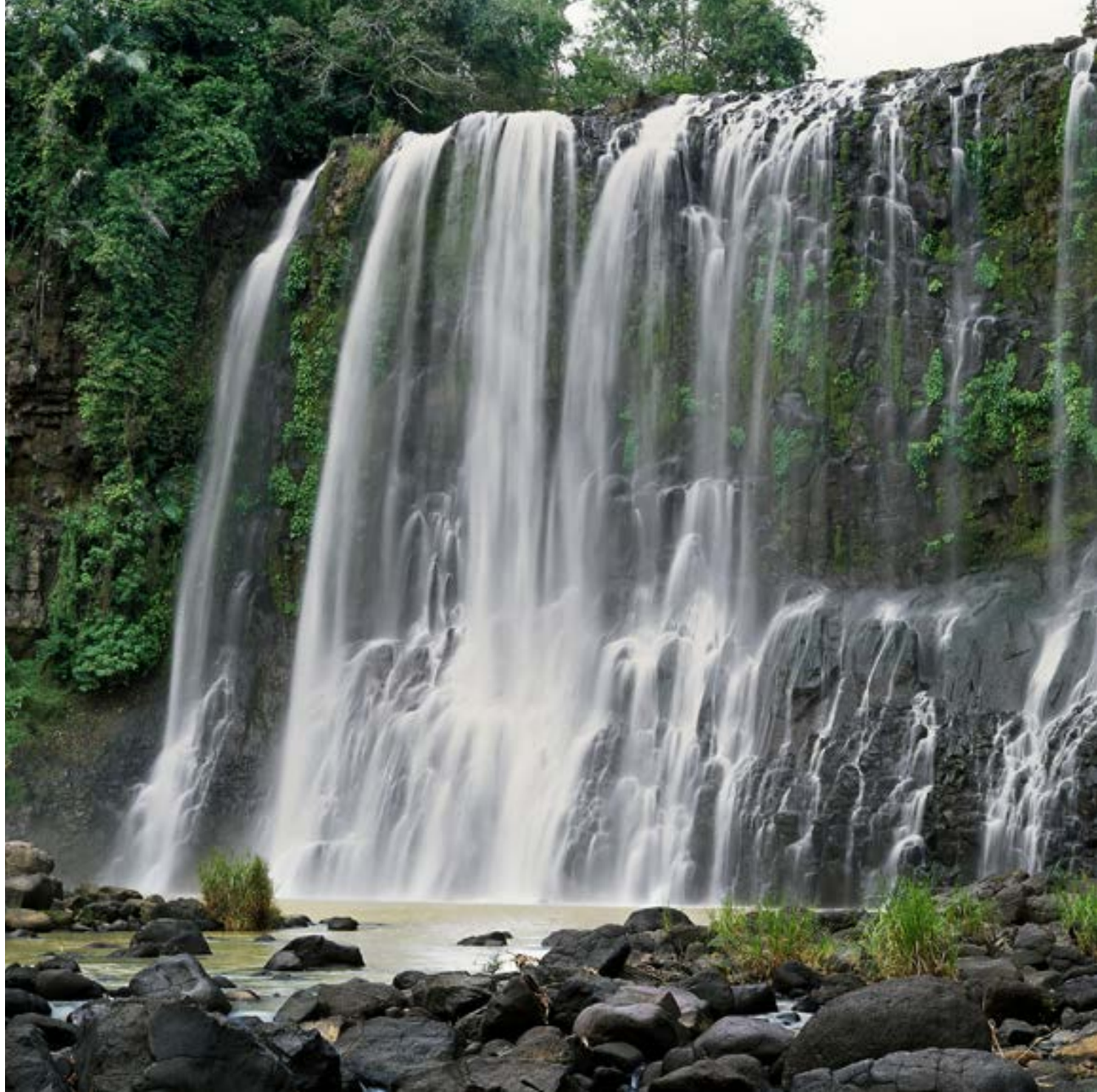
Sustainable human development will occur when all humans can have fulfilling lives without degrading the planet. This, we believe, is the ultimate goal. Two leading indicators have identified how we can get there. Ecological Footprint data tells us that, given current population and available land area, an Ecological Footprint of less than 1.7 global hectares per person makes a country's resource demands globally replicable.

The United Nations' Human Development Index (HDI)—which measures a country's average achievements in the areas of health, knowledge, and standard of living—tells us that an HDI higher than 0.8 is considered "high human development."

Combining these two indicators gives clear minimum conditions for sustainable human development and shows how much more we need to "think inside the box." Despite growing commitments to sustainable development, most countries today do not meet both minimum requirements. As individuals, organizations, countries and regions work on advancing sustainability and human development, decision makers need data and metrics in order to set goals and track progress. Measures such as the Ecological Footprint and the HDI are critical to setting targets and managing development projects.

Sustainable Development Goals:

The United Nations' recently proposed Sustainable Development Goals (SDGs) include promoting inclusive and sustainable economic growth as well as well-being for all. Economic activities ultimately depend on ecological assets and their capacity for provisioning primary resources and life-supporting ecological services; managing the latter is becoming a central issue for decision-makers worldwide. Thus, living within the limits of the biosphere's ecological assets is a necessary condition for global sustainability, which can be quantitatively measured and must be met to achieve SDGs.



Overview: The Philippines' Ecological Situation

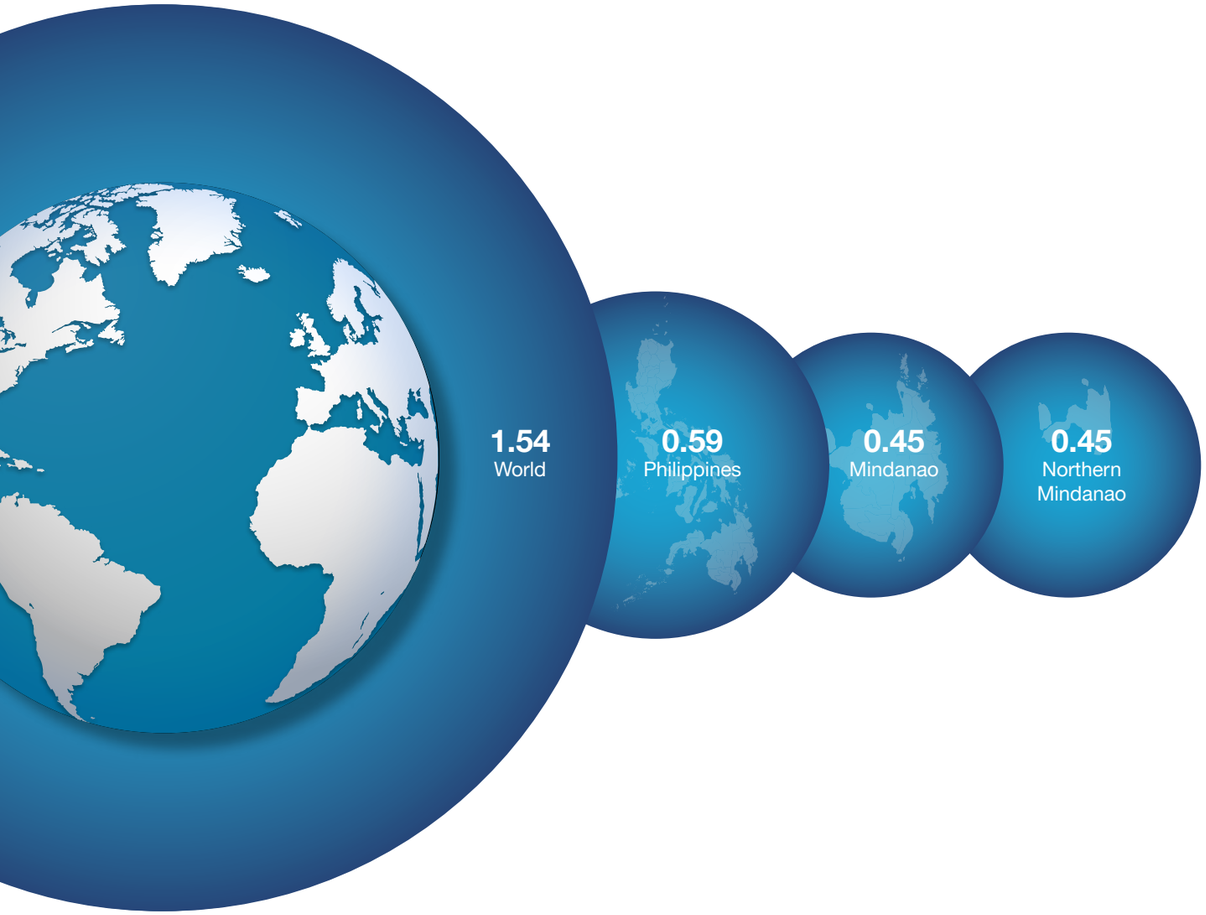
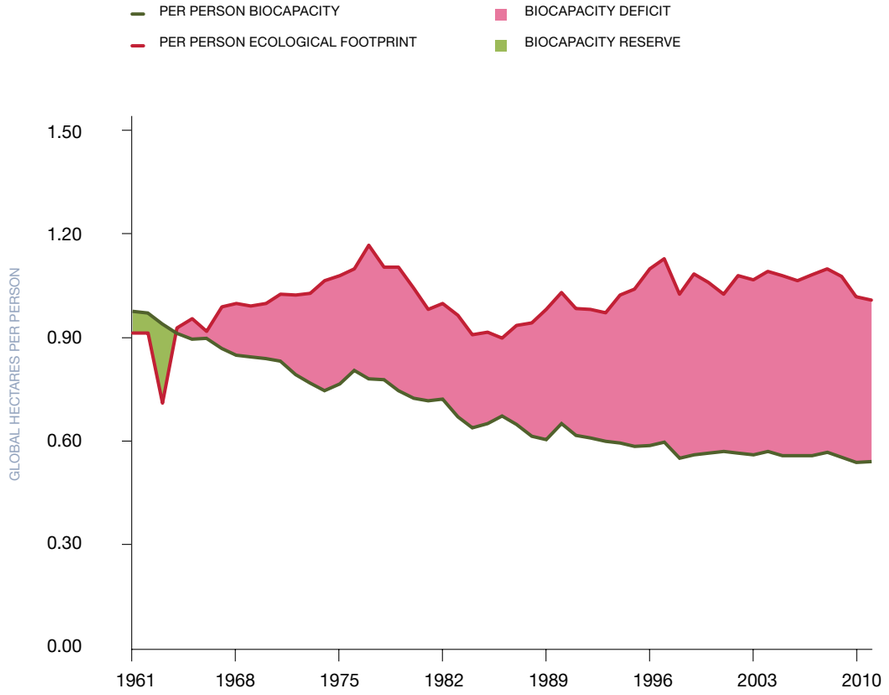


FIGURE 3.
NUMBER OF PLANETS IF EVERYONE LIVED LIKE THE AVERAGE PERSON IN THE WORLD, PHILIPPINES, OR NORTHERN MINDANAO

FIGURE 4.
PER PERSON FOOTPRINT AND BIOCAPACITY OF THE PHILIPPINES.
IF THE RED LINE (FOOTPRINT) IS ABOVE THE GREEN LINE (BIOCAPACITY),
THE COUNTRY RUNS A BIOCAPACITY DEFICIT, INDICATED BY PINK SHADING.



The Ecological Footprint of the Philippines is below the world average biocapacity per person of 1.8 gha, indicating that parts of the population lack access to basic needs, such as food, clothing and shelter. At the same time, the Philippines' Footprint still exceeds the biocapacity resources within its borders. According to Global Footprint Network calculations, if all people in the world lived like an average person in the Philippines, we would only need 0.59 Earths. This contradiction shows the precarious situation of populations in rapidly developing nations seeking to improve quality of life while simultaneously trying to minimize strain on ecological resources.

By comparison, the average Footprint of people in the Asia-Pacific region is 1.6 global hectares per person.

Ecological Footprint in Context: Philippines, Mindanao, Northern Mindanao

Since the 1960s, the Philippines' total Ecological Footprint has nearly quadrupled. In 2011, the last year for which data are currently available, the nation demanded more than twice what it had in available. That year, the country demanded nearly twice what it had in available biocapacity (51 million gha).

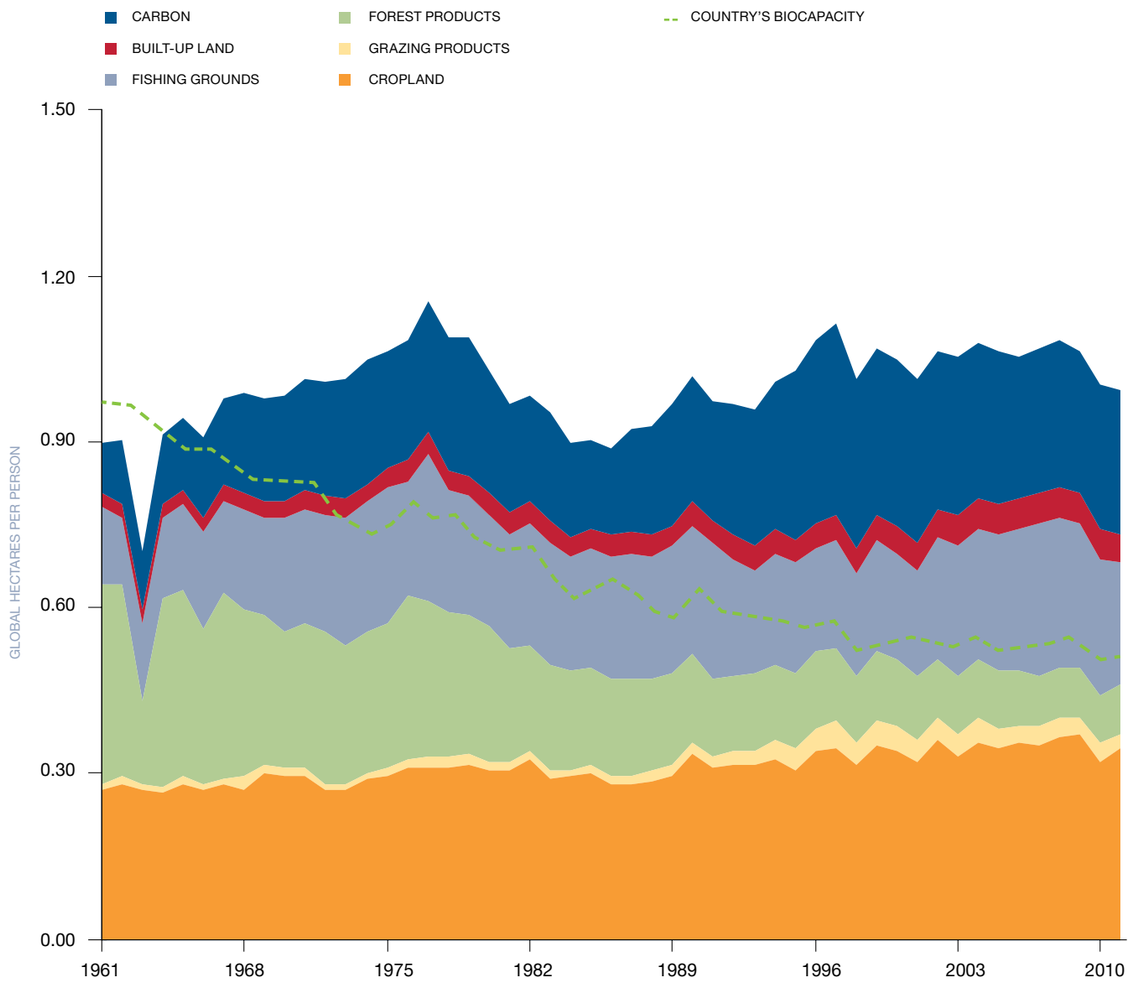
The largest component of the country's Ecological Footprint is cropland (35%); followed by carbon (26%), fishing ground (22%), forest products (9%) and built-up land (5%).

Ecological Footprint by Land Type (gha per person)

	Philippines	Mindanao	Northern Mindanao
Cropland	0.35	0.29	0.28
Grazing Products	0.03	0.02	0.02
Forest Products	0.09	0.07	0.07
Fishing Grounds	0.22	0.19	0.18
Built-up Land	0.05	0.04	0.04
Carbon	0.26	0.17	0.17
TOTAL	**1.01**	**0.78**	**0.77**

For additional detail on Northern Mindanao's Ecological Footprint, see page 27

FIGURE 5.
PER PERSON FOOTPRINT BY LAND TYPE AND BIOCAPACITY OF THE PHILLIPINES.



Philippines

The Philippines is a country that is facing rapid change, with an economy that has shifted—and continues to shift—from agriculture to industry and services. This change, along with the needs of a growing population, means that the country is more dependent on biocapacity from other countries than ever before. While this is not uncommon in a global economy, this growing dependence poses risks in a resource-constrained world. For example, food is a major component of the average household's ecological budget in the Philippines. Since food is directly linked to world food prices and is exposed to volatility, this creates a food security risk for the nation. In these situations, it is the most vulnerable among the population—those who cannot afford to pay higher prices—who will suffer the most.

Without adequate resources, any progress in human development or the economy cannot last. As the Philippines strives toward increasing economic security and improving lives of its residents, incorporating environmental realities in all its planning will help ensure continued success.

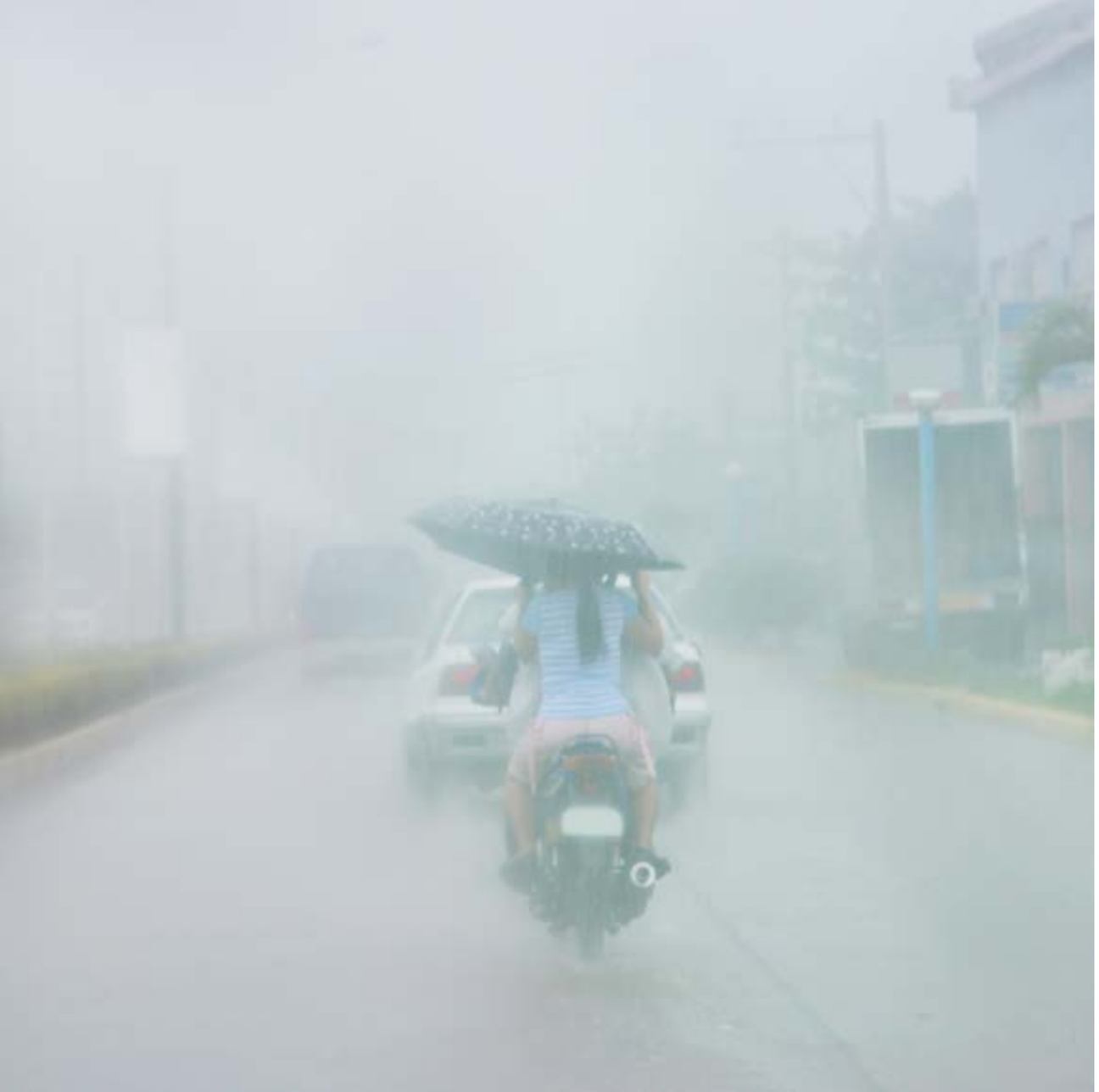
Philippines

The average Footprint for a person living in the Philippines is below the world average (1.0 gha vs. 2.6 gha)

Although average Footprint is relatively small, the Philippines has a very small amount of available resources within it's border

The Philippines is heavily refliant on importing natural resources to meet demand

A big part of the average household footprint is food (roughly 50%)



Mindanao

The nation's rapid development and rising economy, as well as its vulnerabilities, are mirrored in Mindanao, which is set to experience rapid growth over the coming years. It is also expected to face high climate risks due to an increased frequency in tropical storms[1] in the last quarter of the year. In addition, while the climate scenario for rainfall shows an increasing trend for Luzon and Visayas regions, there is generally a decreasing trend for Mindanao, especially by 2050.[2] The same climate change study also reports the following national climate trends, among others, under a medium emission scenario:

1. All areas of the Philippines will get warmer, more so in the relatively warmer summer months;
2. Annual mean temperatures (average of maximum and minimum temperatures) in all areas in the country are expected to rise by 0.9 °C to 1.1 °C in 2020 and by 1.8 °C to 2.2 °C in 2050;
3. In terms of seasonal rainfall change, generally, there is a substantial spatial difference in the projected changes in rainfall in 2020 and 2050 in most parts of the Philippines, with reduction in rainfall in most provinces during the summer season (March, April and May) making the usually dry season drier, while rainfall increases are likely in most areas of Luzon and Visayas during the southwest monsoon (June, July and August) and in September, October and November, making these seasons still wetter, and thus with likelihood of both droughts and floods in areas where these are projected; and,
4. The northeast monsoon (December, January and February) season rainfall is projected to increase, particularly for areas characterised by Type II climate with potential for flooding enhanced. In this context, it is timely to generate evidence of Mindanao's natural capital and to demonstrate how ecosystems contribute to climate resilience and support sustainable development across key sectors of the economy and local livelihoods.

Mindanao

Cropland, fishing grounds, and carbon are the largest part of the Mindanao Footprint

Mindanao's per person forest Footprint—or demand for forest products—is slightly lower than that of the natural Forest Footprint

Mindanao is at risk for significant climate shifts, including rainfall

[1] Tropical cyclone Sendong in 2011 was the first major cyclone impacting Mindanao in 88 years. It was followed by cyclone Pablo in 2012; both cyclones caused widespread destruction and fatalities.
[2] Climate Change in the Philippines, Philippine Atmospheric, Geophysical and Astronomical Services Administration, 2011

Northern Mindanao

Northern Mindanao, also known as Region 10, is situated at the north-central part of Mindanao Island. It comprises five (5) provinces: Bukidnon, Lanao del Norte, Misamis Occidental, Misamis Oriental, and Camiguin. Northern Mindanao has a total of 84 municipalities, 2,022 barangays, including two (2) highly urbanised cities - Cagayan de Oro City and Iligan City, with Cagayan de Oro City as Northern Mindanao's regional center. With a total population of 4,619,540 (2015), Northern Mindanao is the 8th most populated region in the Philippines, and second most populated in Mindanao, consisting of 19% of Mindanao's total population with a population growth rate of 2.14% per year.

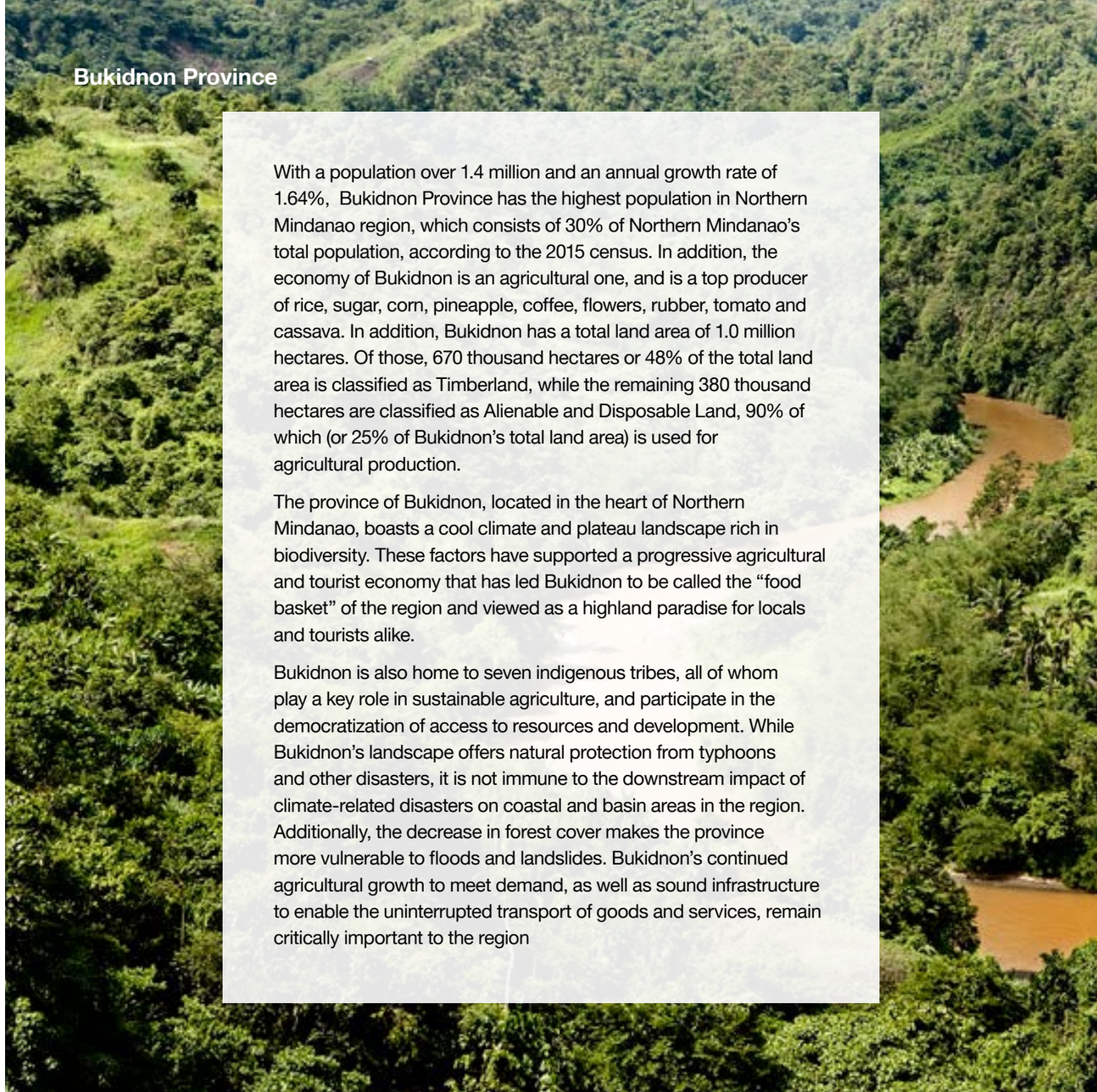
The regional economy of Northern Mindanao is the largest in Mindanao, and has maintained the highest Gross Regional Domestic Product (GRDP) growth rate at 6.0% over the past 13 years, with a total value of PHP 268.3 million as of 2014. The three (3) main sectors which drive Northern Mindanao's economy are the its Services Sector (42%, PHP 112.8 million), followed by its Industry Sector (36.6%, PHP 92.9 million) and its Agriculture, Hunting, Forestry and Fishing (AHFF) Sector (23.4%, PHP 62.7 million). It is the leading agricultural producer in Mindanao, with banana, pineapple, chicken, hog, corn and palay as its top 6 commodities, and continues to be the top producer of pineapple in the Philippines. In addition to agriculture, Northern Mindanao has the second largest industrial sector, second largest services sector, the second highest output in manufacturing, and has the highest revenue in electricity and water compared to other regions in Mindanao. As a tourism hotspot, ecotourism through Northern Mindanao's rich natural resources play a key role in the growth of it's tourism sector. Major attractions such as the Maria Cristina Falls in Lanao del Norte, the Misamis Occidental Aquamarine Park, Dhilayan Adventure & Forest Park in Bukidnon, and Agutayan Island in Misamis Oriental all form part of Northern Mindanao's all form part of Northern Mindanao's ecotourism sector.

Northern Mindanao

Northern Mindanao is the 8th most populated region the Phlippines and has the largest economy throughout all of Mindanao

Northern Mindanao is the leading agricultural producer thoughout all of mIndanao, has the highest revenues in electricity and water, and is an ecotourism hotspot

If everyone on Earth lived like the average Northern Mindanao resident, we would only need half of the planet to survive



Bukidnon Province

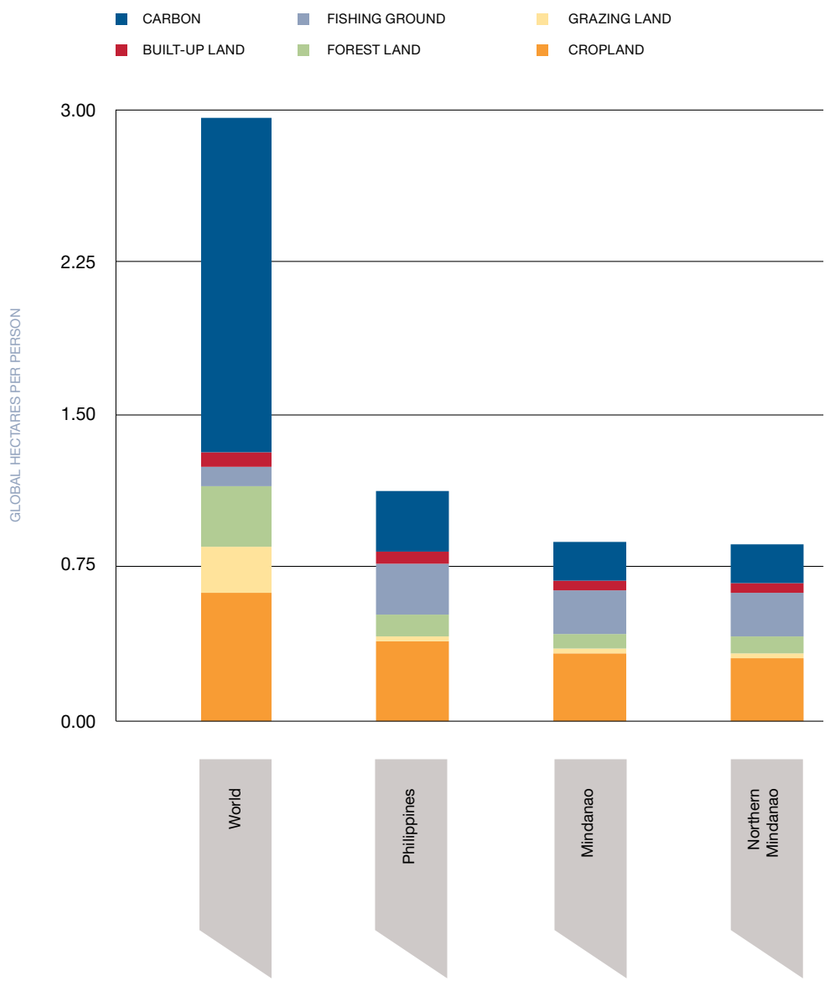
With a population over 1.4 million and an annual growth rate of 1.64%, Bukidnon Province has the highest population in Northern Mindanao region, which consists of 30% of Northern Mindanao's total population, according to the 2015 census. In addition, the economy of Bukidnon is an agricultural one, and is a top producer of rice, sugar, corn, pineapple, coffee, flowers, rubber, tomato and cassava. In addition, Bukidnon has a total land area of 1.0 million hectares. Of those, 670 thousand hectares or 48% of the total land area is classified as Timberland, while the remaining 380 thousand hectares are classified as Alienable and Disposable Land, 90% of which (or 25% of Bukidnon's total land area) is used for agricultural production.

The province of Bukidnon, located in the heart of Northern Mindanao, boasts a cool climate and plateau landscape rich in biodiversity. These factors have supported a progressive agricultural and tourist economy that has led Bukidnon to be called the "food basket" of the region and viewed as a highland paradise for locals and tourists alike.

Bukidnon is also home to seven indigenous tribes, all of whom play a key role in sustainable agriculture, and participate in the democratization of access to resources and development. While Bukidnon's landscape offers natural protection from typhoons and other disasters, it is not immune to the downstream impact of climate-related disasters on coastal and basin areas in the region. Additionally, the decrease in forest cover makes the province more vulnerable to floods and landslides. Bukidnon's continued agricultural growth to meet demand, as well as sound infrastructure to enable the uninterrupted transport of goods and services, remain critically important to the region

Ecological Footprint: Key Findings

FIGURE 6.
ECOLOGICAL FOOTPRINT FOR WORLD, PHILIPPINES, MINDANAO, AND NORTHERN MINDANAO



As with the Philippines as a whole, Mindanao's Ecological Footprint falls well below that of the world average Ecological Footprint. Consuming 0.78 gha per person, people in Mindanao also have an Ecological Footprint that is lower than world-average available biocapacity, which is currently 1.8 gha per person. If everyone on the planet lived like the average person in Mindanao, we would need only 0.45 Earths to be sustainable.

The largest components of the total Footprint of Mindanao are cropland and fishing grounds. By comparison, the largest components of the Philippines' total Ecological Footprint are cropland Footprint and carbon Footprint (forest area required to absorb carbon emissions). Growing demand on Mindanao as the country's food basket and growing external demand met through exports, will continue to pose risks to both cropland and fishing grounds if the resources are not monitored and managed wisely.

As a percentage of total Ecological Footprint, Carbon Footprint makes up the third largest demand category. Notably, it is much lower than world average carbon Footprint, likely due to low incidence of personal vehicle transportation and minimal reliance on fossil fuel use for energy. Mindanao's per person forest Footprint—or demand for forest products—is slightly lower than that of the national forest Footprint. This may indicate that the root cause of deforestation and other challenges may stem from national dependencies on Mindanao's forest products, rather than consumption by households within Mindanao. In addition, unsustainable farming practices, such as "slash-and-burn" agriculture, which upland populations rely on for subsistence, lead to forest destruction.

Focus on Northern Mindanao's Ecological Footprint

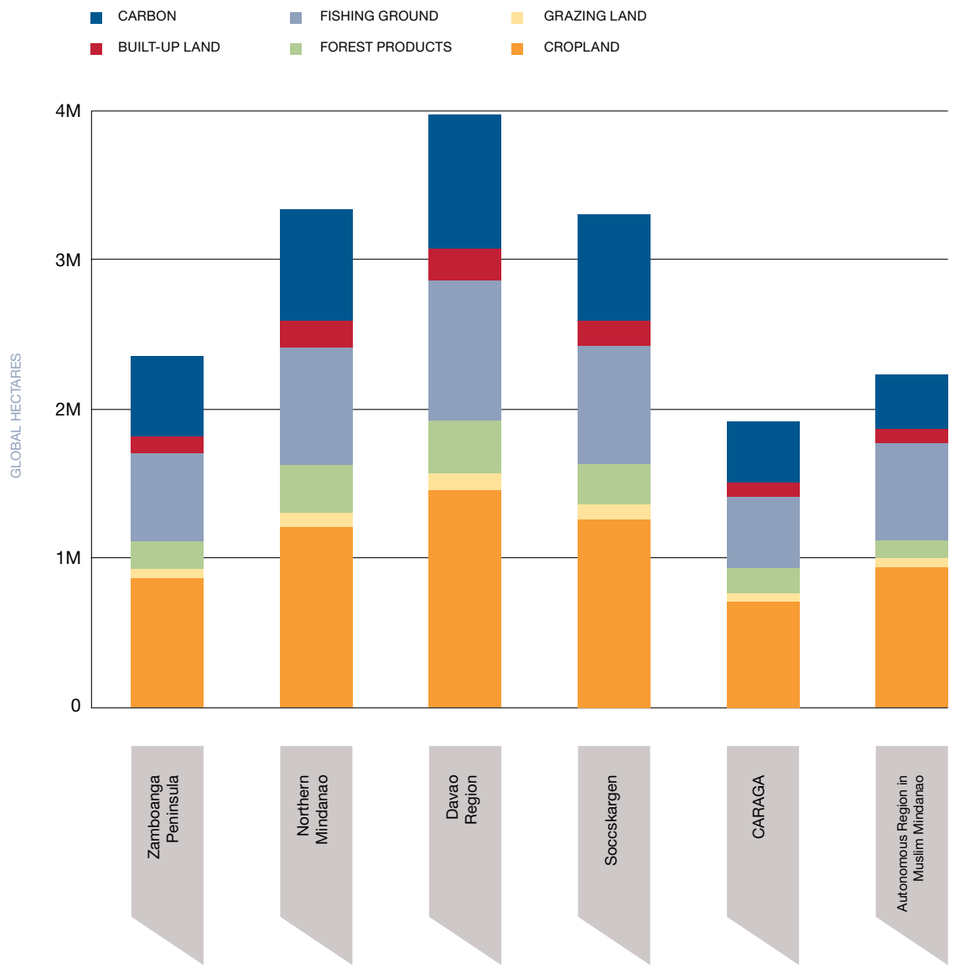
ECOLOGICAL FOOTPRINT

	PER PERSON (global hectares per person)	TOTAL (global hectares total)
Northern Mindanao	**0.77**	**2,800,000**
Bukidnon	0.61	789,000
Camiguin	0.62	52,000
Misamis Occidental	0.70	568,000
Lanao Del Norte	0.85	519,000
Misamis Oriental	1.07	871,000

Like Mindanao, if everyone in the world lived like the average Northern Mindanao resident, we would need only 0.45 Earths. The Ecological Footprint for Northern Mindanao also very closely resembles that of the rest of Mindanao, though slightly smaller: Mindanao has an Ecological Footprint of 0.78 gha per person and Northern Mindanao has an Ecological Footprint of just 0.77 gha per person. Likewise, the breakdown by land category is similar, with cropland and fishing grounds comprising the largest proportion of the total Ecological Footprint.

Each of the provinces in Northern Mindanao have similarly small per person Ecological Footprints, but Bukidnon has the smallest with 0.61 gha per person. This indicates that people in Bukidnon likely do not have access to sufficient materials to meet basic needs, including food and shelter. The large difference in per person Footprint between Bukidnon and Philippines average suggest large disparities in terms of access to resources for basic needs between people in Northern Mindanao and wealthier parts of the country.

FIGURE 7.
MINDANAO REGION'S ECOLOGICAL FOOTPRINT BY COMPONENT IN MILLION GLOBAL HECTARES



Biocapacity: Key Findings

Mindanao's Biocapacity

Mindanao has a very low per person biocapacity (0.62 gha). However, Northern Mindanao is ever-more resource constrained, with just 0.41 gha available per person. Cropland makes up 57% of the total biocapacity available in Mindanao, whereas it only makes up 34% of the biocapacity in Northern Mindanao. Mindanao as a whole also has more fishing ground biocapacity (0.07 gha per person, compared to 0.02 gha for Northern Mindanao) and more forest biocapacity (0.16 gha per person, compared to 0.13 gha).

These differences suggest that communities in Northern Mindanao are at even greater risk from a changing climate and unstable economic markets, having less capacity to absorb losses or shocks from external forces.

Biocapacity by Land Type (gha per person)

	Philippines	Mindanao	Northern Mindanao
Cropland	0.31	0.36	0.21
Grazing Land	0.01	0.02	0.02
Fishing Grounds	0.07	0.07	0.02
Forest	0.10	0.16	0.13
Built-up Land	0.05	0.02	0.02
TOTAL	**0.54**	**0.62**	**0.41**

Forest and Cropland Biocapacity: Northern Mindanao and Bukidnon

FIGURE 8.
NORTHERN MINDANAO BIOCAPACITY (GHA)

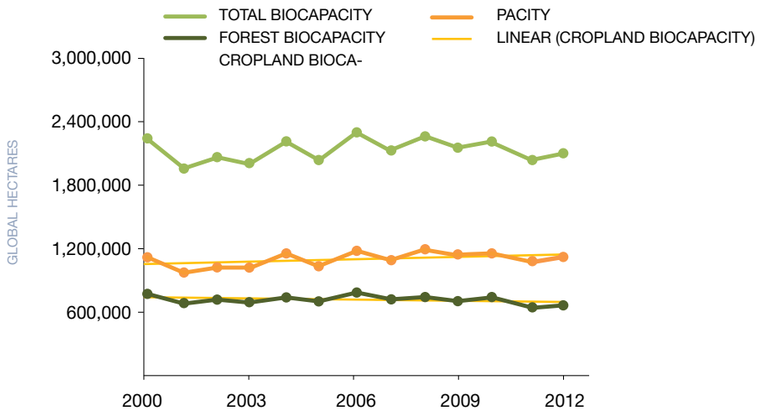
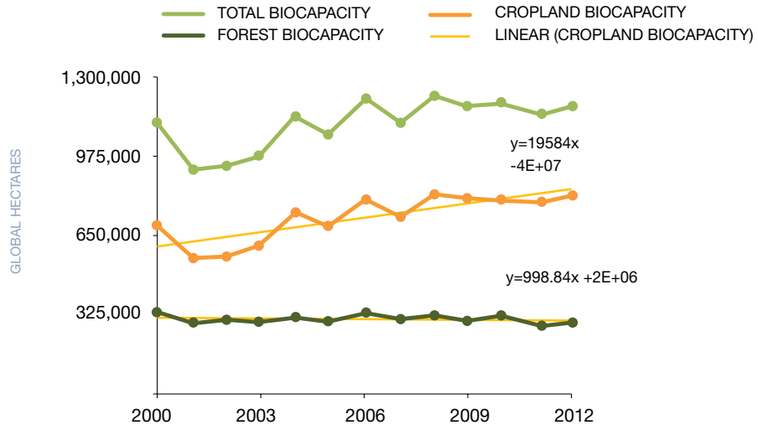


FIGURE 9.
BUKIDNON BIOCAPACITY (GHA)



If we take a closer look at Northern Mindanao and Bukidnon over the last decade and a half, we see some potentially concerning trends—especially for forest and cropland biocapacity. Total biocapacity of Northern Mindanao decreased by 7% from 2000 to 2012, despite some evidence of positive trends.

The major factor in this decline is an overall decrease in forest biocapacity by 15% during that period. Between 2000 and 2012, forest biocapacity decreased on average 1% every year from the previous year in both Northern Mindanao and Bukidnon. Total forest biocapacity shows 12% overall decrease in Bukidnon during the same time period.

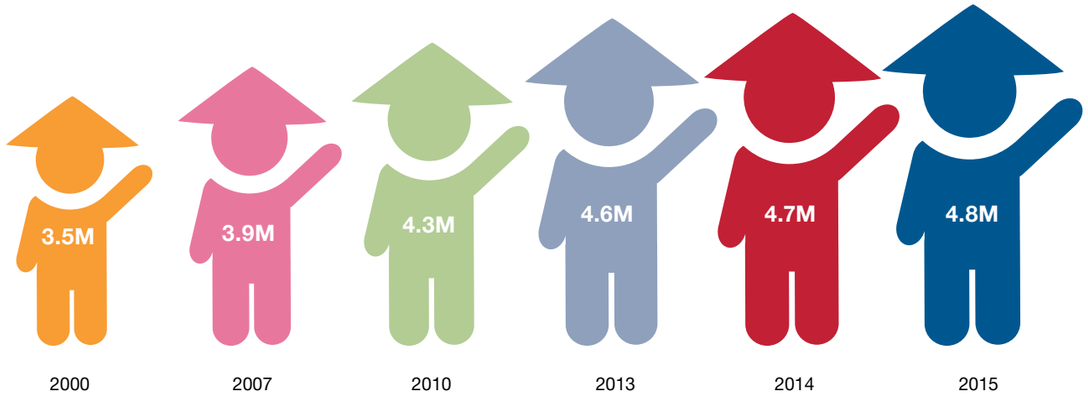
In Northern Mindanao, cropland biocapacity has remained relatively unchanged over the same time period, even as cropland yields have decreased by 10%. Since the area used for cropland has increased by roughly the same percentage, the overall cropland biocapacity was approximately the same in 2012 as it was in 2000.

The situation in Bukidnon, however, is significantly different. Although cropland yield decreased by the same percentage as Northern Mindanao, the cropland area has expanded by almost 30%, which results in Bukidnon having a cropland biocapacity of 17% greater than in 2000. Forest land biocapacity, by contrast, has steadily decreased. According to the DENR, Fire and Slash and Burn are the leading forest disturbances both in Northern Mindanao region and Bukidnon province.

If the forest yield keeps decreasing with the same rate for the next 13 years, the area of forest would need to be increased by 98,000 hectares in order to keep the forest biocapacity constant. [3]

[3] Due to lack of reliable data available, change in forest area has not been incorporated into the calculation directly.

Population is Biggest Factor Affecting Ecological Footprint and Biocapacity



As population grows in the region, the conversion of cropland into residential, industrial and commercial areas presents a challenge in maintaining sufficient cropland to sustainably support communities. Although total cropland biocapacity is increasing, land use change will continue to put pressure on already limited natural resources. In addition to land-use change, Mindanao will be faced with major challenges related to climate change in the coming decades, Mindanao's vulnerability to climate change stems from its long coastlines and strong dependence on agriculture and hydropower. Furthermore, Mindanao faces the highest risk of impacts due to temperature rise and El Niño drought in the country. According to the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), Mindanao is most vulnerable to the impacts of El Niño due to its proximity to the equator. While El Niño is a natural phenomenon, PAGASA says climate change accelerates increasing temperatures in Mindanao. Furthermore, according to the Department of Agriculture, Mindanao was the hardest hit region during the 2015 extended period of drought, with estimated cropland damages at Php 3.6 billion (USD 76.4 million). Moreover, OXFAM reports Central Mindanao as the hardest hit region in Mindanao, with reports of 70 to 100% crop damage for rice and corn across different areas. Over 11 thousand farmers have been affected by the drought, with total damages to crops estimated at P103.7 million (USD 2.3 million).

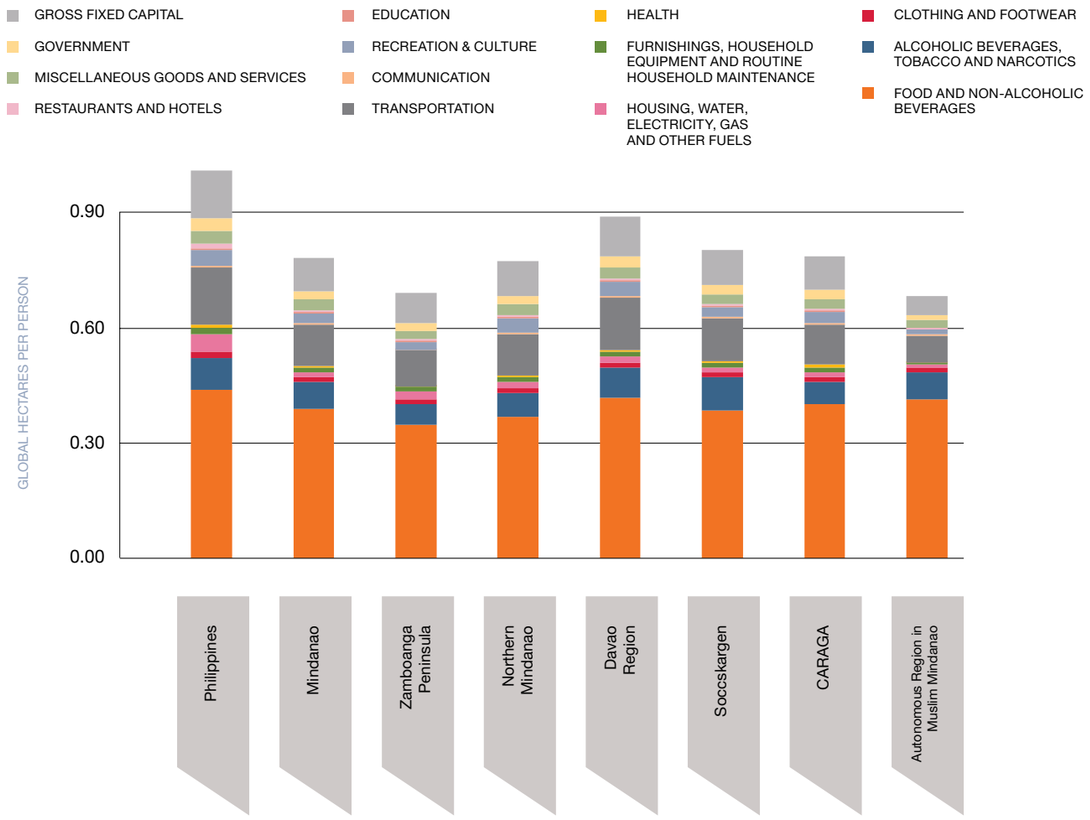
Northern Mindanao Factors

As a population grows, more land will be used for industrial and commercial development, leaving less to use for food

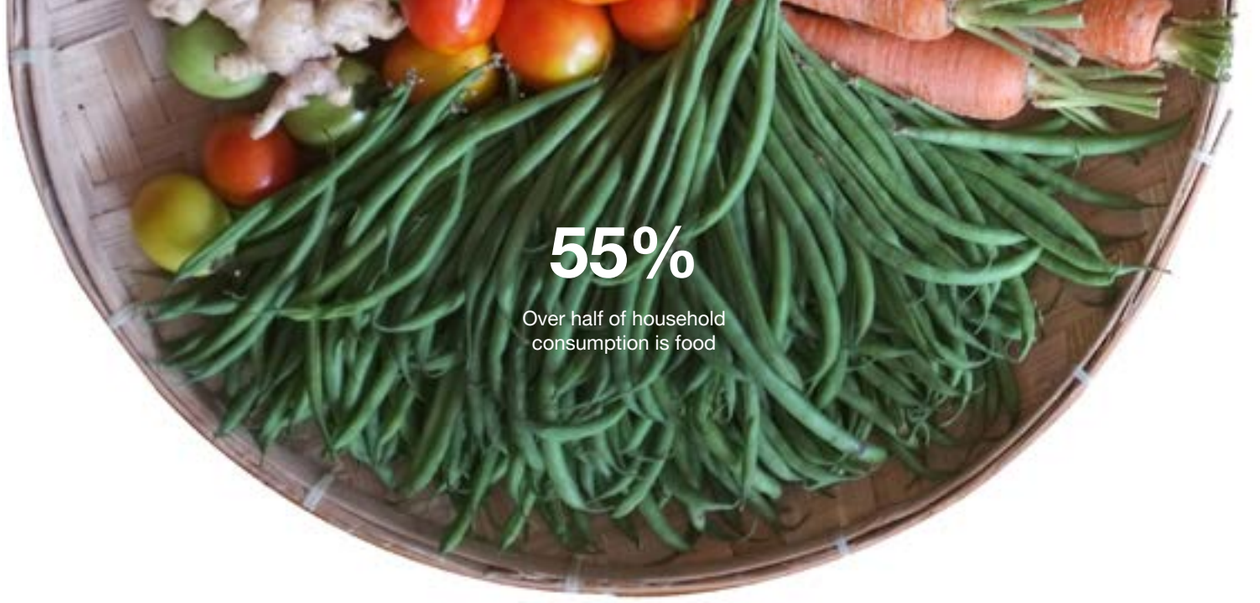
Temperature rise and drought are big risk factors for Northern Mindanao's agricultural production

Measuring Humanity's Demand on Nature

FIGURE 10.
CONSUMPTION LAND USE MATRIX (IN GLOBAL HECTARES)
PEOPLE'S FOOTPRINT BY COMPONENT



Ecological Footprint accounting can be supplemented by exploring direct consumption data of a country or region. To gain more granular detail, overall demand on nature by humans can be broken up into three main demand categories: households, government consumption, and investments. By looking closer at these broad categories, we can find additional insights into the activities that drive the Ecological Footprint of consumption.



Philippines

In the Philippines, 85% of the total Footprint comes from household consumption, including food, housing, mobility, and goods and services. Since the Philippines demand for natural resources exceeds the biocapacity available within its borders, it is important to note that this accounts for all demand, regardless of whether these are produced domestically or imported from other countries. Over half (55%) of household consumption is from food. With such a low per person Ecological Footprint, it is unsurprising that food is the primary contributor, as caloric intake fluctuates less than other consumption habits from country to country, such as transportation, goods, and housing.

Transportation and goods make up 18% and 14% of total household consumption, respectively. Comparatively speaking, investments in lasting assets, such as construction of buildings, roads, factories and equipment comprises a much smaller proportion of the overall Footprint of consumption (12%). Although only 3% of the Footprint of consumption is from government expenditures, decisions made by government have a large impact on how infrastructure and other development expands, which can have a major impact on consumption patterns. The government Footprint can be influenced directly by investments in infrastructure and indirectly by voting.

Mindanao

Mindanao, which is home to 23% of the country's population, comprises just 18% of the total Ecological Footprint of the Philippines.
Much like the rest of the country, the Footprint of consumption in Mindanao follows similar patterns, with 86% of total Footprint attributed to households, 11% attributed investments and a mere 3% attributed to government expenditure. An even larger proportion of the Footprint is ascribed to food consumption (65%), with small proportions in the transportation (16%), goods (13%), services (6%), and housing (2%) categories. Ecological Footprint of consumption by household can be further broken down into 12 categories based on UN-COICOP (United Nations Classification Of Individual Consumption According to Purpose).[4]
In comparison to the Philippines' average, Northern Mindanao has a lower Footprint in all 12 consumption categories.

If everyone on the planet has lifestyles similar to the people in Mindanao, we would only need 0.45 Earths to support our resource consumption habits. However, since the bio-capacity in Mindanao is only 0.63 gha per person, 25% more land is required to meet current consumption level.

	World	Philippines	Mindanao	Northern Mindanao
Ecological Footprint (gha per person)	2.65	1.01	0.78	0.77
Biocapacity (gha per person)	1.72	0.54	0.62	0.41
Number of countries (or regions) required	**1.54**	**1.86**	**1.25**	**1.88**

[4] COICOP categories can be found here: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=5

61%

Northern Mindanao lives on a Footprint 61% lower than world average Footprint

18%

Mindanao region as whole consists of 18% of Philippines' total Footprint. (23% of total population in Philippines lives in Mindanao region)

Key Drivers

As we assess resource consumption and availability in the Philippines, Mindanao, and Northern Mindanao, there are several key characteristics that influence the overall resource situation and, consequently, the steps that can be taken to inform sustainable policies at the national and regional levels.

Since the largest proportion of the region's Ecological Footprint of consumption is food, the importance of agriculture and access to reliable agricultural markets will likely shape future resource balances.

In Northern Mindanao, as agricultural production grows and cropland biocapacity increases to meet demand for food products, pressure on other land types will increase because of land use change. Already, we have seen declines in forest land biocapacity, which will likely continue as both crop land and infrastructure grow. Demand for forest products is relatively low currently, but may change as infrastructure and population expand.

DISCUSSION POINTS

1. *What current local practices are key drivers to the Footprint and biocapacity trends?*
2. *Which local government agencies, NGOs and community organizations can work together to find alternative, more sustainable practices?*

Risks and Opportunities

Currently, the natural resource situation in the Philippines presents some major challenges to meet the growing needs of its people. The shifting economy and growing population will continue to place pressure on the country's limited natural resources. In addition, climate change impacts, including sea level rise and changing weather patterns, will likely exacerbate this pressure, further increasing the country's vulnerability to climate change.

However, with careful land use planning, there is potential to alleviate these pressures and create opportunities for improved resource management. Changes to land use, protection laws, agricultural practices, energy use, and forest management could all establish more sustainable systems in order to mitigate for the changes to economic structure and climate.

While development is essential to ensure that the basic needs that determine a quality of life are met for the population, the Philippines faces particular risks brought on by climate change—namely, its impact on coastal areas and fisheries, as melting icecaps continue to cause sea levels to rise, and increase ocean acidification. The loss of fisheries and human habitats will have a downstream impact on inland areas, particularly the interplay between an increased need for infrastructure and built-up land, and an increase in demand of food crops and land used for agricultural purposes. This challenge is particularly true for Mindanao, as it continues to develop and the country grows more dependent on its resources for food security.

Risks and Opportunities

Climate change, sea level rise, and growing population will place pressure on natura resources

Sound land use planning and development management can alleviate some of these pressures

A key balance must be made between land for infrastructure and housing, and land for a agriculture

Ecological Footprint and Human Development Index (HDI)

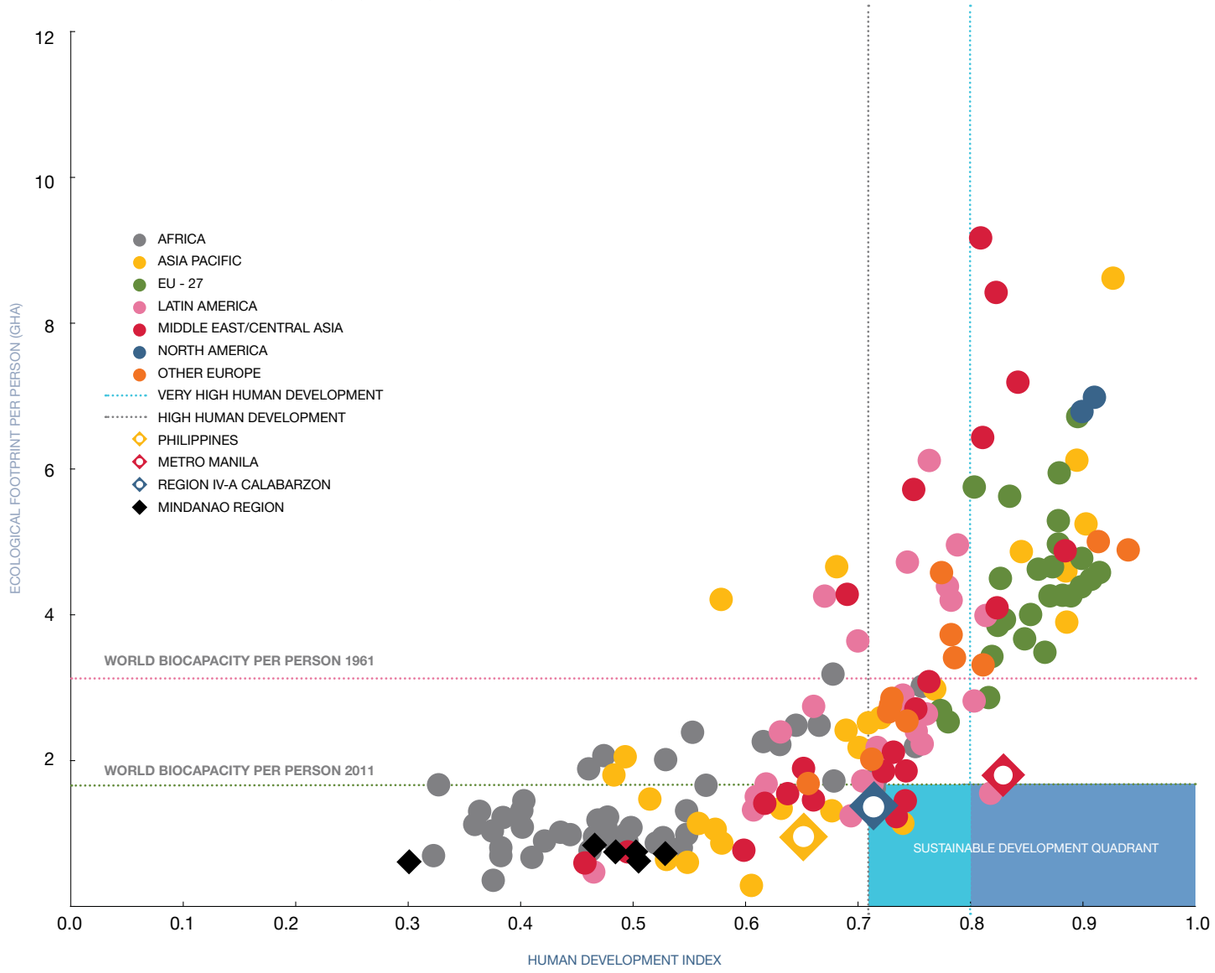
Sustainable development seeks to improve human well-being while maintaining the natural resource and ecosystem service base for use by future generations. Sustainable development also recognizes the necessity of a long-term, secure access to ecological assets. The environmental bottom-line condition for sustainability, in other words living within the means of nature, can be assessed with the Ecological Footprint.

At the same time, human well-being can be approximated using the United Nation's widely recognized Human Development Index (HDI). This index was created by economists in 1994 to provide an alternative to national income as a standard metrics of development (Amartha Sen and Mahbub ul Haq, 1994). A country's HDI is composed of three components: longevity, education and income. According to the United Nations Development Programme, an HDI of 0.71 or higher is considered "high human development."

Combining both the Human Development Index and the Ecological Footprint, the EF-HDI framework provides a macro-level, comparative assessment of nations' progress towards the two main sustainability goals of living well within the limits of the planet. Very few countries and regions meet the two minimum criteria requirements for globally replicable sustainable development (depicted in the shaded blue area in the bottom-right corner of figure 11): a per person Footprint lower than world biocapacity of 1.7 gha and an HDI of at least 0.7. Metro Manila is very close to this standard, with an HDI of 0.83 and an Ecological Footprint of just 1.8 gha per person. Much more common, however, is to see that Footprint increases as HDI increases. At the planetary level, humanity also exceeds these minimum requirements for sustainable development.

The HDI graph on the right depicts the per person Ecological Footprint of consumption of the Philippines, Metro Manila, and Northern Mindanao Region, in addition to countries in the rest of the Asia-Pacific region, Africa, EU-27, Latin America, Middle East/Central Asia, North America, and the rest of Europe. For all countries so far, development has been—and still is—a resource-intensive journey, improved welfare being fuelled by resource extraction at ever increasing scales (Moran et al., 2008). In many cases, small increases in HDI are accompanied by much larger increases in Ecological Footprint.

FIGURE 11.
ECOLOGICAL FOOTPRINT PER PERSON (2011) AND HDI (2012)



Raising Quality of Life Without Increasing Demand on Nature

The Philippines also sees large disparities in wealth distribution. Accordingly, higher Footprint is associated with higher HDI. The Philippines' trajectory over the past 40 years is moving it closer to being "in the box" of the high development and low Footprint. Since 1970, its per person Ecological Footprint has risen only slightly, while at the same time the country has made steady gains in its Human Development Index score. Counter to the trend in most countries, the Philippines is finding a way to increase the average quality of life of its residents without increasing their per person demand on biocapacity.

At the same time, ensuring progress in the well-being of all residents remains a challenge. While the HDI shows that the average resident has achieved higher levels of development, the Philippines' Gini coefficient—an indicator of income disparity—is the highest of countries in Southeast Asia. Average measures of development may not reflect segments of the population that do not have access to the resources required to meet basic needs such as food, shelter, health and sanitation. If the Philippines is to continue making advances in human development that extend beyond short-term progress, it must find approaches that work with, rather than against, nature's budget. The country's growing population and the world's increasing resource demands are making these challenges ever more difficult.

Northern Mindanao lags behind the Philippines in both HDI and Ecological Footprint, indicating that its population is among the country's most vulnerable. However, there is an opportunity to move Northern Mindanao into the sustainable quadrant if resource limits are incorporated into development plans, managing both human development and ecological resources without sacrificing one for the other.

Ecological Footprint and HDI Human Development Index

The Philippines is finding ways to increase quality of life without increasing demand on natural resources

The Philippines sees large disparities in wealth distribution

Northern Mindanao populations are among the nation's most vulnerable

Ecological Footprint in Policymaking

The Ecological Footprint is a resource accounting tool that helps cities, provinces and countries understand their ecological budget and gives them the data necessary to manage their resources and secure their future.

National governments using the Footprint are able to:

1 Assess the value of their country's ecological assets
2 Monitor and manage their assets
3 Identify the risks associated with ecological deficits
4 Use data to inform and benchmark policy

A macro-level indicator such as Ecological Footprint accounting can offer guidance to the planning and management of societies given the reality of resource limitations. However, while it can help in identifying areas of potential intervention and in setting goals, the methodology must be complemented with issue-specific indicators in policy development and implementation, as no single indicator is able to comprehensively monitor all aspect of sustainability. [5]

Once policies are implemented, specific measures and indicators can be used to monitor progress in the specific issues; however these might not provide a broad enough picture of the full range of consequences of the implemented policies or the overall direction in which such policies are driving the whole system. A broader systemic view is thus needed to in-tegrate the various issues-specific policies and provide an overall view of sustainability. Over time, Ecological Footprint accounting can help track policies' effectiveness in reducing humanity's appropriation of Earth's biocapacity.

Ecological Footprint accounting is therefore useful for providing policy-makers with a crosscutting viewpoint and for encouraging new "limits aware" thinking in the policy process. Such a macro-level integrated view—informative for the "early warning" and "monitoring" stages of the policy cycle—is just as important as the capacity to inform the drafting and implementation of issue-specific policies.

[5] "On the Rationale and Policy Usefulness of Ecological Footprint Accounting", Galli, et al, 2015.

The Ecological Footprint can be used in several stages of the policy cycle, described above.

Ecological Footprinting in Policy Making

The Ecological Footprint shows a big picture trends in natural resource use

Understanding overall use can help drive sustainable policies

Continued Ecological Footprint measurements can show progress over time

AFD Mindanao Planning Matrix

Type of Local Plan	Part of Policy Cycle	Ecological Footprint Application	Outcomes
Comprehensive Development Plan (CDP)	CDP Planning Process Stage 1: Generating the Planning Data Base	Ecological Footprint can help identify which issues need to be addressed most urgently from a broad perspective. Current Ecological Footprint and biocapacity assessments show that resource use in the region exceeds that which the land is able to provide without trade. As development plans are established, this information illustrates the importance of sustainable development practices that take resource security into consideration while creating opportunities for economic growth.	With the identification of key Ecological Footprint results, policy-makers can prioritize actions. Ecological Footprint and biocapacity results for this region show that despite the small resource metabolism of the people who live in the region, natural resources are insufficient to meet the population's demand, especially cropland and fishing grounds. These results can help communicate the importance of the CDP to decision makers, communities and funding organizations.
	Monitoring	Footprint projections and changes over time can be used to monitor the short and long-term effectiveness of policies. Ecological Footprint and biocapacity results can be used as a baseline metric for assessing the overall state of the region compared to the past and to other regions.	Help track the consequences of issue-specific policies at a wider level (e.g., overshoot-ending, societal well-being, economic stability). Over time, Ecological Footprint and biocapacity results will reveal whether progress has been made from an overarching perspective—has development been sustainable? Have changes in the Ecological Footprint of the region been supported by positive changes in available biocapacity?
Comprehensive Land Use Plan (CLUP)	CLUP Planning Process Step 4: Situational Awareness	Detailed Ecological Footprint data from the Consumption Land Use Matrix (CLUM) identify the largest consumption categories for the region and the land uses required to provide those resources. Identification of these categories, coupled with other social and economic context, provides insight into the drivers of consumption.	The key consumption categories identified in the CLUM are an important starting point for thinking about comprehensive land use planning, potentially highlighting gaps between available biocapacity and the resource metabolism of the region. Food consumption is by far the largest category for this region, highlighting the importance of land use planning that emphasizes agriculture generally and food security in particular. This finding can be used to help communicate the importance of land use planning and enforcement of the plans to support the well-being of the people in the region.
	Monitoring	Current Ecological Footprint and biocapacity data can be used to establish a baseline	
Forest Land Use Plan (FLUP)	FLUP Planning Process Phase 1: Data & Map Collection, Phase 2: Situational Analysis	Historical Ecological Footprint and biocapacity data are used to assess trends in forest product use, and forest area and productivity.	Declines in forest biocapacity over the studied time period highlight the importance of interventions and the Renaissance Project. Initial results can be used to help communicate the importance of the project to decision makers, participants and funding organizations.
	Monitoring	Current Ecological Footprint and biocapacity data can be used to establish a baseline – how much forest biocapacity is the region providing currently? How big is the Ecological Footprint by comparison? How does this compare to the rest of the country?	After implementation of the FLUP, Ecological Footprint and biocapacity data can be measured again to assess how things have changed over the project timeline. Has biocapacity increased? Has it kept up with the demands of the people in the region? Overall, is there measurable improvement or decline in forest biocapacity?

Forest Land Use Planning

The Ecological Footprint and Biocapacity analysis supports the initial phases of the FLUP planning process by providing a broader situational outlook of the ecological situation. Led by the Municipal Technical Working Groups (TWGs), the first step of the FLUP process is the collection of reliable data and maps as a basis for decision making during the second and third phase of the FLUP process. The second phase of the FLUP identifies issues and opportunities based on the data gathered during the first phase. This phase conducts an assessment of the overall state and current trends in Forest and Forest Lands, as well as identifies competing and complimenting interests and claims among stakeholders. Historical Ecological Footprint and biocapacity data are used to assess trends in forest product use, and forest area and productivity. Declines in forest biocapacity over the studied time period highlight the importance of interventions and the Renaissance Project. Initial results can be used to help communicate the importance of the project to decision makers, participants and funding organizations.
As directed by Executive Order 318 entitled "Promoting Sustainable Forest Management in the Philippines", Local Government Units are required to incorporate FLUPs into their respective Comprehensive Land Use Plans (CLUPs). Integrating Ecological Footprint as-sessments into FLUPs allows CLUPs to take into consideration the assessments on forest footprint and biocapacity, as shown in the table above.

Comprehensive Land Use Planning

The Comprehensive Land Use Plan (CLUP) is a development plan that contains specific proposals to guide and regulate growth of a city or municipality. It takes into account all sectors in the development process such as socio-economic, infrastructure and utilities, land use, demography and local administration. Ecological Footprint assessments are strongly aligned with the following objectives of CLUP:

1. The promotion of sustainable development
2. The preservation of special natural features and environmentally critical areas
3. The provision of guidelines for the appropriate use of natural resources.

The outputs of Step 4 require the submission of a socio-economic, demographic, physical and environmental profile/data base of a city or municipality. Detailed Ecological Footprint data from the Consumption Land Use Matrix (CLUM) identify the largest consumption categories for the region and the land uses required to provide those resources. Identification of these categories, coupled with other social and economic context, provides insight into the drivers of consumption. The key consumption categories identified in the CLUM are an important starting point for thinking about comprehensive land use planning, potentially highlighting gaps between available biocapacity and the resource metabolism of the region. Food consumption is by far the largest category for this region, highlighting the importance of land use planning that emphasizes agriculture generally and food security in particular. This finding can be used to help communicate the importance of land use planning and enforcement of the plans to support the well-being of the people in the region.

Comprehensive Development Planning

Comprehensive Development Planning is an action plan used by local administrations to develop and implement sectoral and cross-sectoral programs and projects. Unlike CLUPs, where development is framed in the geographical and territorial sense, CDPs focus on "multi-sectoral" development. A key component of the CDP is the Environmental Management Plan, which consolidates the environmental consequences of all development proposals within the municipality, with the end goal of providing mitigating and preventive interventions to anticipate their adverse impacts to the environment. In addition, the CDP requires the study of the various demands and pressures on a given ecosystem. Current Ecological Footprint and biocapacity assessments show that resource use in the region exceeds that which the land is able to provide without trade. As development plans are established, this information illustrates the importance of sustainable development practices that take resource security into consideration while creating opportunities for economic growth.

Policy Recommendations

DISCUSSION POINTS

1. *What current policies at the national and subnational level are linked to the current Footprint trends?*
2. *What opportunities are there to leverage or change existing policies to address these challenges?*
3. *Are there new policies that can help alleviate these resource pressures?*

Current trends reflect the need for immediate and long-term actions, which require collaboration among various agencies, and policies that will remain in perpetuity. Any efforts to address these challenges can only be sustained through consistent management and monitoring of both the supply and demand of resources. In order to make this happen, the Department of Interior and Local Government (DILG), the Department of Environment and Natural Resources (DENR) Northern Mindanao Regional Office, Provincial Environmental and Natural Resource Office (PENRO) and the City/Municipal Environment and Natural Resources Office (CENRO/MENRO) must work collaboratively on the following:

- The Mindanao Development Plan and Framework envisions Comprehensive Land Use Plans (CLUPs) in Mindanao to incorporate climate change adaptation. However, mitigation measures are necessary to address declining forest biocapacity in Northern Mindanao, and to mitigate the effects of climate change impacts to the region's ecosystems. This is in line with the National Climate Change Action Plan's (NCCAP) guiding principle to pursue mitigation actions as a function of adaptation, and increase the resilience of ecosystems to climate change impacts.

- Build robust understanding of resource capacity and consumption trends in Mindanao to provide a holistic and sustainable approach to CLUPs and Forest Land Use Plans (FLUPs) in the region. Awareness of biocapacity and consumption trends provides holistic and long- term views in the management and governance of ecosystems.

- Support local governments in Northern Mindanao in the enforcement of forest laws, and management of Northern Mindanao's protected areas under the National Integrated Protected Areas System (NIPAS) Act of 1992, specifically the Mt. Kitanglad Protected Area Act (Republic Act 8978). This serves as a basis to stop illegal logging and the development, maintenance of upper water basin forests.

- Reforestation is needed to mitigate the steadily decreasing forest land of Bukidnon. Forest area needs to be increased by 98,000 hectares assuming forest yield continues to decrease at the same rate for the next 13 years.

- Promote sustainable agricultural practices as an alternative to slash and burn. This includes supporting existing initiatives, which provide sustainable approaches to fuel wood, such as the development of tree farming sites specifically for fuel wood, to reduce stress on protected areas. The Forest Management Bureau statistics cite fire, slash and burn as the main causes of forest disturbance in Northern Mindanao.

DISCUSSION POINTS

1. *What are the challenges to plans and policies that can address current Footprint trends and resource pressures?*

2. *What options do policymakers have in light of these challenges?*

Scenarios and Links to Renaissance Project

Given the importance of cropland and forest land to Northern Mindanao it is useful to consider the trends in land use and cropland and forest yields, which all influence cropland and forest biocapacity.

Cropland Projections

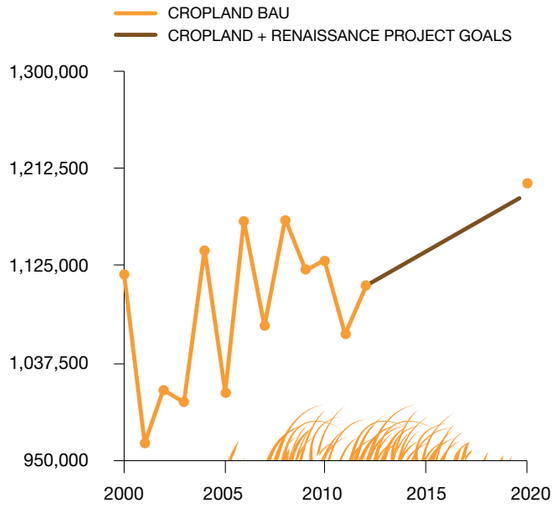
Forecasting out to 2020, cropland biocapacity will increase by 7% over 2012 levels (see figure 12), provided agricultural yields change at the same rate they have been since 2000. With a growing population and increasing demand for agricultural products, this level of productivity would not likely be sufficient to meet the needs of the population. The RENAISSANCE Project has a stated goal of increasing agricultural production for food security by 2,719 ha and increasing development of new agri-business opportunities by 2,719 ha between now and 2020. The additional 5,438 ha of cropland would result in a 9% increase in cropland biocapacity. In conjunction with other land use and agricultural policy, this effort will likely help the region become closer to achieving the productivity required to meet increasing demand of Northern Mindanao communities and surrounding areas.

Cropland Projections

Cropland biocapacity will likely increase by 7% by 2020, but will fall short of demand

The RENAISSANCE Project strategies will push cropland biocapacity to increase 9%

FIGURE 12.
CROPLAND BIOCAPACITY TRENDS (GHA)



Forest Land Projections

By contrast, forest land biocapacity is expected to increase by only 1% between 2012 and 2020, given current trends. In a “business-as-usual” projection, assuming rates of change in forest yields remain constant, biocapacity in Northern Mindanao will increase less than 4000 gha in 8 years. However, the Renaissance Project plans to reforest approximately 52,000 ha of degraded land, including over 16,000 ha for conservation and nearly 36,000 ha for commercial forest over the lifetime of the project. If successful, these efforts will lead to a 10% increase in forest biocapacity over that available in 2012 by 2020.

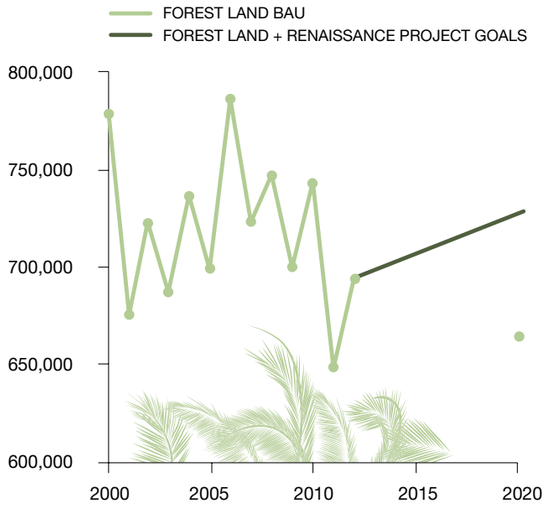
Through its Project Renaissance, the Agence Française de Développement has set out ambitious goals to address current trends. These types of aggressive and proactive measures are necessary to ensure the long-term social and economic viability of Northern Mindanao. This success is deeply rooted in the availability of Northern Mindanao’s natural resources. The goals of this project would address the many challenges reflected in the Footprint, biocapacity and HDI findings of this report by strengthening livelihoods based on agriculture, ensuring the health of its forest lands, and thus increasing its biocapacity, and meeting the food needs of the population without increasing its dependency on imports. Because of the Philippines’ dependency on Northern Mindanao, this investment and its returns go beyond the region’s borders, affecting the country and its people as a whole.

Forest Land Projections

At current rates, forest land biocapicity would increase only 1% by 2020

If successful, RENAISSANCE strategies will increase this to 10% or 1000 times greater

FIGURE 13.
FOREST LAND BIOCAPACITY TRENDS (GHA)



Project Renaissance Goals

2,719ha

Agricultural production for food security

2,719ha

Development of new agri-business opportunities

52,000ha

Reforestation of degraded lands: approx. 52,000ha (conservation: approx. 16,000ha + commercial forest: approx. 36,000ha)

Through its Project Renaissance, the Agence Française de Développement has set out goals to address current trends. These measures outlined by the AFD (see graphic) are necessary to ensure the long-term social and economic viability of Northern Mindanao. This success is deeply rooted in the availability of Northern Mindanao's natural resources. The goals of this project would address the many challenges reflected in the Footprint, biocapacity and HDI findings of this report by strengthening livelihoods based on agriculture, ensuring the health of its forest lands, and thus increasing its biocapacity, and meeting the food needs of the population without increasing its dependency on imports. Because of the Philippines' dependency on Northern Mindanao, this investment and its returns go beyond the region's borders, affecting the country and its people as a whole.

	2020 Forecast		2012-2020
	Business as Usual	Renaissance Project	Percent Change
Cropland biocapacity (gha)	1,184,529		7% increase
		1,200,463	9% increase
Forest land biocapacity (gha)	676,564		1% increase
		728,099	10% increase

APPENDIX: Ecological Footprint

How is the Ecological Footprint calculated?

The Ecological Footprint measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes and to absorb their emitted waste, given prevailing technology and resource management. On the waste side, current National Footprint Accounts only include carbon dioxide from fossil fuel burning. The Footprint and the biocapacity areas are expressed in global hectares (biologically active hectares with world average biological productivity). To express results in global hectares, Footprint calculations use yield factors to normalize countries' biological productivity to world averages (e.g., comparing tonnes of wheat per U.K. hectare to the corresponding world average) and equivalence factors to take into account differences in world average productivity among area types (e.g., world average forest versus world average cropland).

Footprint and biocapacity results for countries are calculated annually by Global Footprint Network, based on United Nations statistics. Collaborations with national governments are invited, and serve to improve the data and methodology used for the National Footprint Accounts. To date, Switzerland, Belgium and Ecuador have completed a review, and the United Arab Emirates have partially reviewed or are reviewing their accounts. See examples at www. footprintnetwork.org/reviews. The continuing methodological development of the National Footprint Accounts is overseen by a formal review committee. A detailed methods paper and copies of sample calculation sheets can be obtained from www.footprintnetwork.org.

Footprint analyses can be conducted at any scale. There is growing recognition of the need to standardize subnational Footprint applications in order to increase comparability across studies and over time. Methods and approaches for calculating the Footprint of municipalities, organizations and products are currently being aligned through a global Ecological Footprint standards initiative. Two editions of standards have already been issued, the initial in 2006 and a second edition in 2009. For more information on Ecological Footprint standards see www.footprintstandards.org.

For additional information about current Ecological Footprint methodology, data sources, assumptions and results, please visit: www.footprintnetwork.org/atlas. For further information on the methodology used to calculate the Ecological Footprint, please see Borucke et al., 2013.[6]

[6] Borucke, M., Moore, D., Cranston, G., Gracey K., Iha, K., Larson, J., Lazarus, E., Morales, JC, Wackernagel, M., Galli, A. 2013, Accounting for demand and supply of the Biosphere's regenerative capacity: the National Footprint Accounts' underlying methodology and framework. Ecological Indicators.

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Phillip Fullon

Presidential Adviser for Environmental Protection (OPAEP)
Secretary J.R. Nereus O. Acosta, Ph.D.

The Provincial Governor
Secretary J.R. Nereus O. Acosta, Ph.D.

Climate Change Commission
Secretary Emmanuel M. de Guzman
Arnold Belver

Data Sources (External)
Department of Environment and Natural Resources
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Storm Sarmiento
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Tink Tank Studio

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Global Footprint Network is a research organization that is changing how the world manages its natural resources and responds to climate change. Since 2003 Global Footprint Network has engaged with more than 50 nations, 30 cities and 70 global partners to deliver scientific insights that have driven high-impact policy and investment decisions. Together, we're creating a future where all of us can thrive within our planet's limits.
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Climate Change Commission of the Philippines (CCC)
The Climate Change Commission is the lead policy-making body of the government of the Philippines which is tasked to coordinate, monitor and evaluate government programs and ensure mainstreaming of climate change in national, local, and sectoral development plans towards a climate-resilient and climate-smart Philippines.
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Office of the Presidential Adviser for Environmental Protection (OPAEP)
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