

9th Mindanao Policy Research Forum
Going Green and Digital for Mindanao's Sustainable and Inclusive Future

Mindanao Clean Energy Living Laboratories (MindaCELLs)

GIS Mapping of Biomass Energy Potential & Resource Assessment of Five Major Crops in Mindanao

Resource Speakers:

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Chairman, ME Department, Xavier University – Ateneo de Cagayan

Project Leader, Mindanao Clean Energy Living Laboratories

TOPIC OUTLINE

1. Project Background of Mindanao Clean Energy Living Laboratories (MindaCELLs)
2. MindaCELLs Project Components
3. *Geographic Information System (GIS) Mapping Biomass Energy Potential of Mindanao*

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The background of the slide is a technical drawing or blueprint. It features various mechanical components such as gears, shafts, and bearings, along with a ruler and a compass. The drawing is rendered in a light green color, matching the overall theme of the slide. The text is centered within a dark green rectangular box.

**WHAT IS MINDANAO CLEAN
ENERGY LIVING LABORATORIES?**



Mindanao Clean Energy Living Laboratories

Dr. Rogelio Golez Jr
Project leader, MindaCELLs
Assistant Professor, ME Department



Funded by the European Union



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PROJECT BACKGROUND

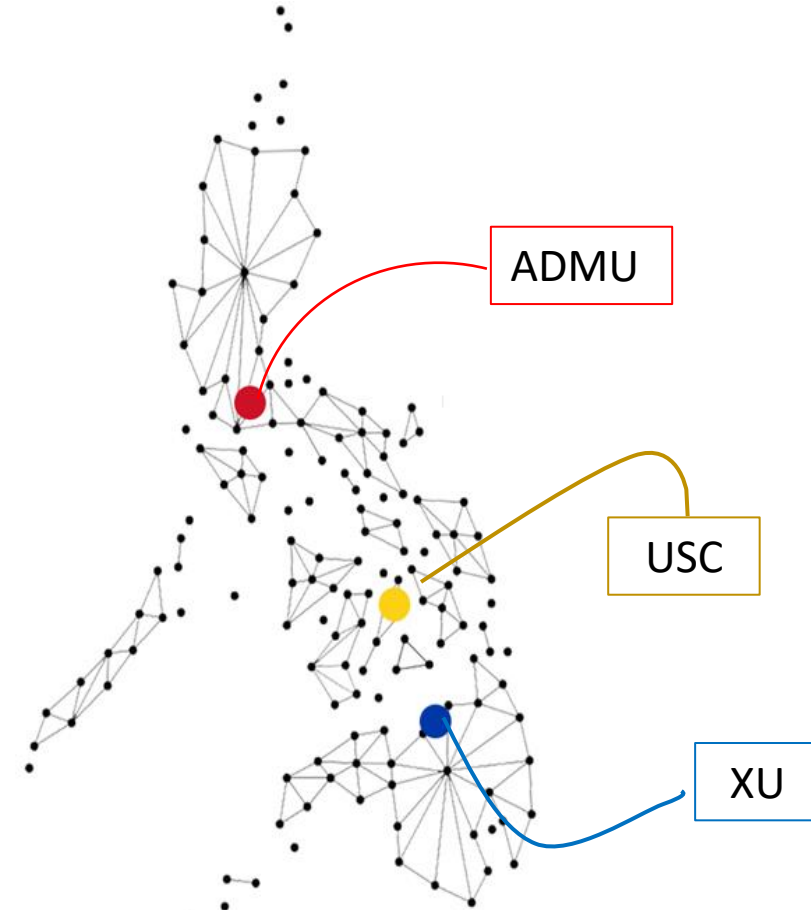
- Access to Sustainable Energy Programme- Clean Energy Living Laboratories (ASEP-CELLs) is a **think-tank** funded by the European Union
- It is being implemented by Ateneo School of Government (ASoG) and in partnership with Manila Observatory (MO), International Council for Local Environment Initiatives- Local Governments for Sustainability Southeast Asia Secretariat (ICLEI), Xavier University (XU) and University of San Carlos (USC)

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PROJECT BACKGROUND

- The general objective of the Project is to increase the awareness and knowledge on rural electrification, energy efficiency, and renewable energy, through the creation of a National Centre of Excellence for Sustainable Energy for All (SE4All) and the Sustainable Development Goal (SDG) 7



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MindaCELLs Project Components

COMPONENT 1:
GIS MAPPING and
HEVR



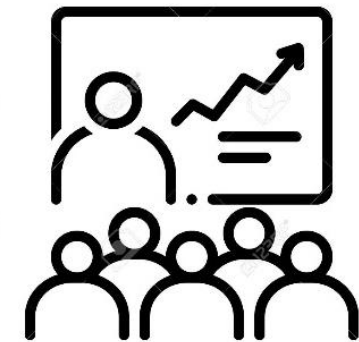
COMPONENT 2:
SOCIO-ECONOMIC
PROFILING AND CASE
STUDIES



COMPONENT 3:
AMO FOR HYBRID RE
SOURCES



Energy Transition and
Sustainability Hub
(EnTranS Hub)



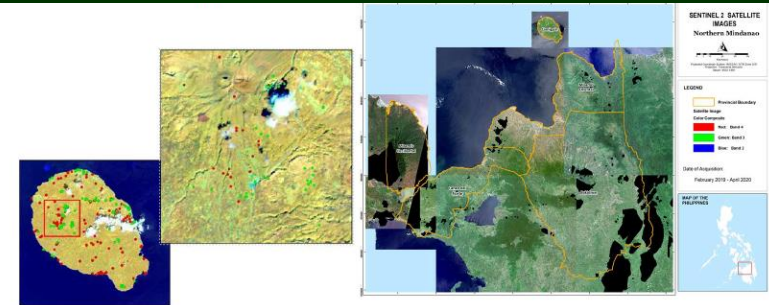
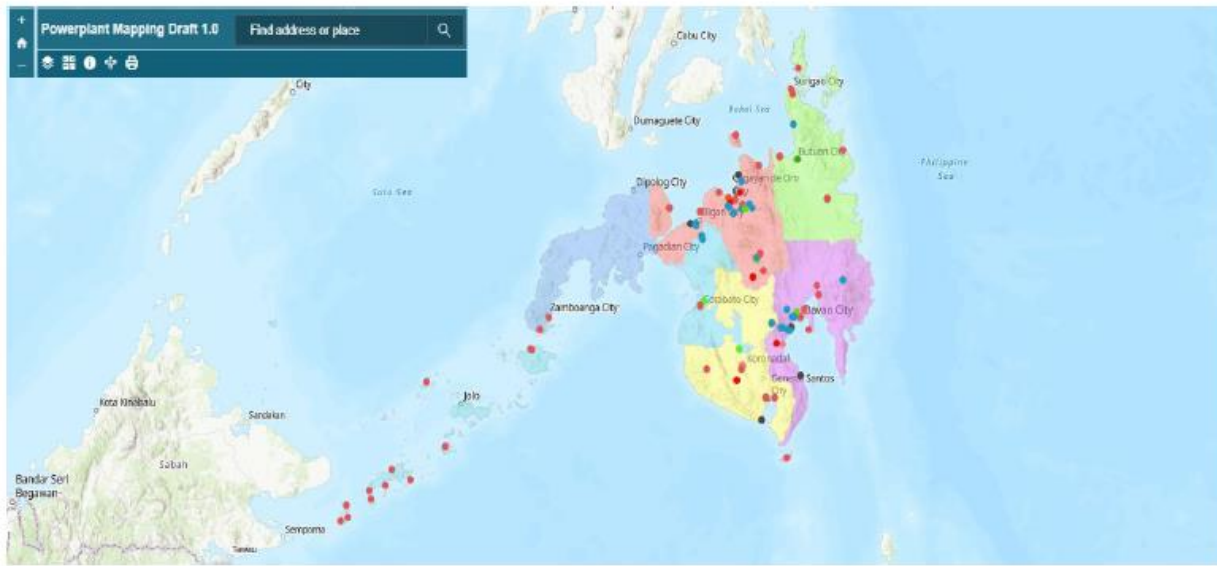
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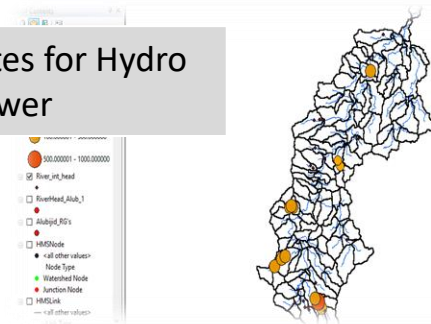


COMPONENT 1: **GIS MAPPING and HEVR**

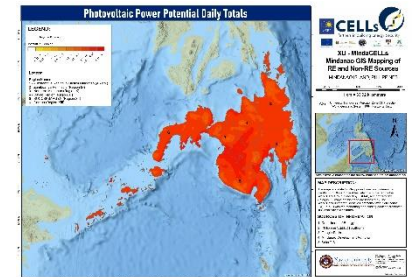
Existing RE and Non-RE Web-GIS



Potential sites for Hydro Power



Wind Map of Mindanao



Solar Irradiance Map of Mindanao

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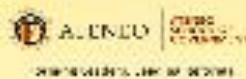
**Geographic Information System
(GIS) Mapping of Biomass Energy
Potential of Mindanao**



CELLs



Partners in Building Energy Security



BIOMASS ENERGY POTENTIAL OF MINDANAO

Jessa Balagtas¹, Jefferson Vallente², Rogelio C. Golez Jr³,

¹JRA-MindaCELLs, Xavier University—Ateneo de Cagayan, Cagayan de Oro City

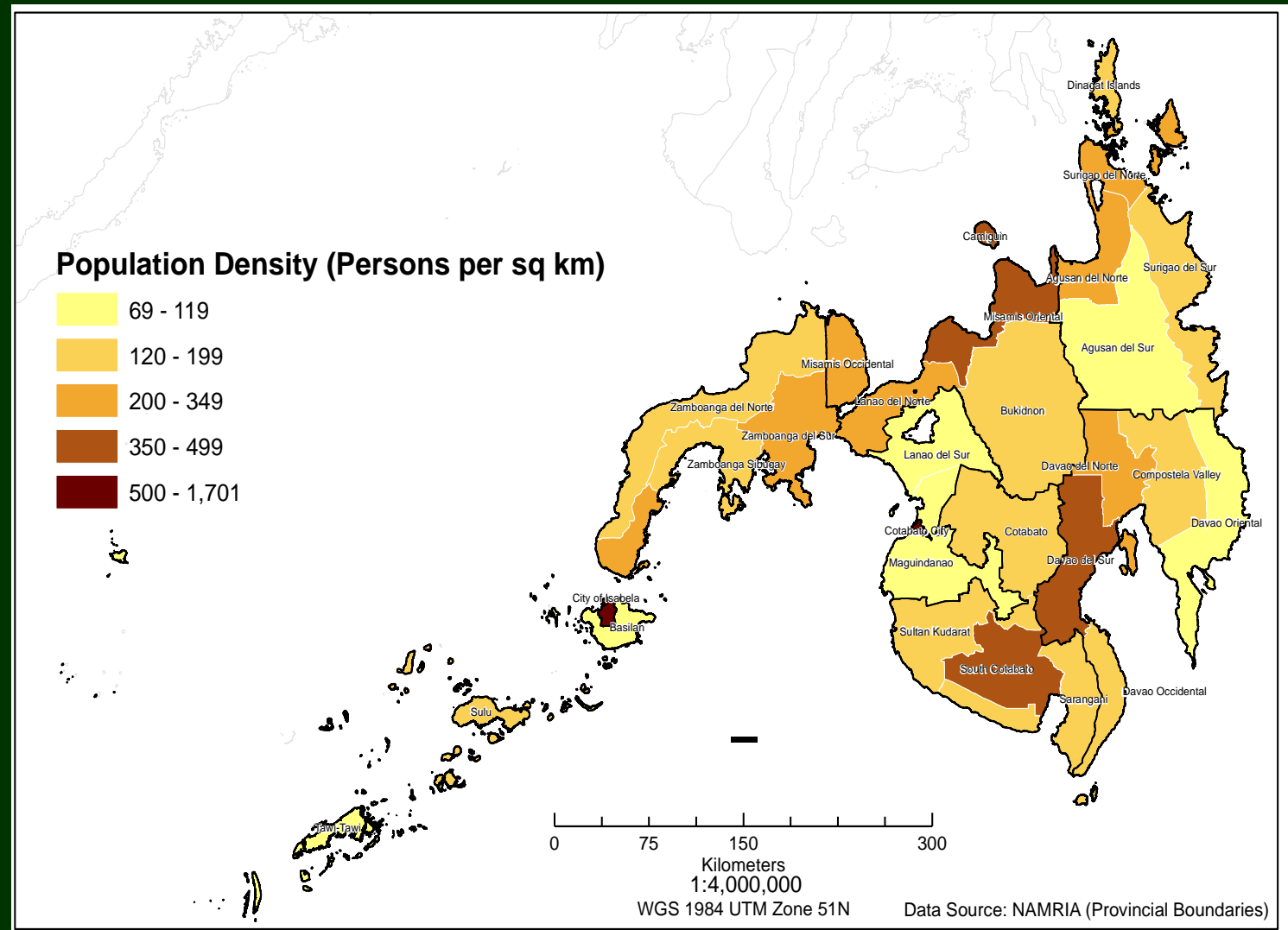
²Component leader-MindaCELLs, Xavier University—Ateneo de Cagayan, Cagayan de Oro City

³Project leader-MindaCELLs, Mechanical Engineering Department, Xavier University—Ateneo de Cagayan, Cagayan de Oro City

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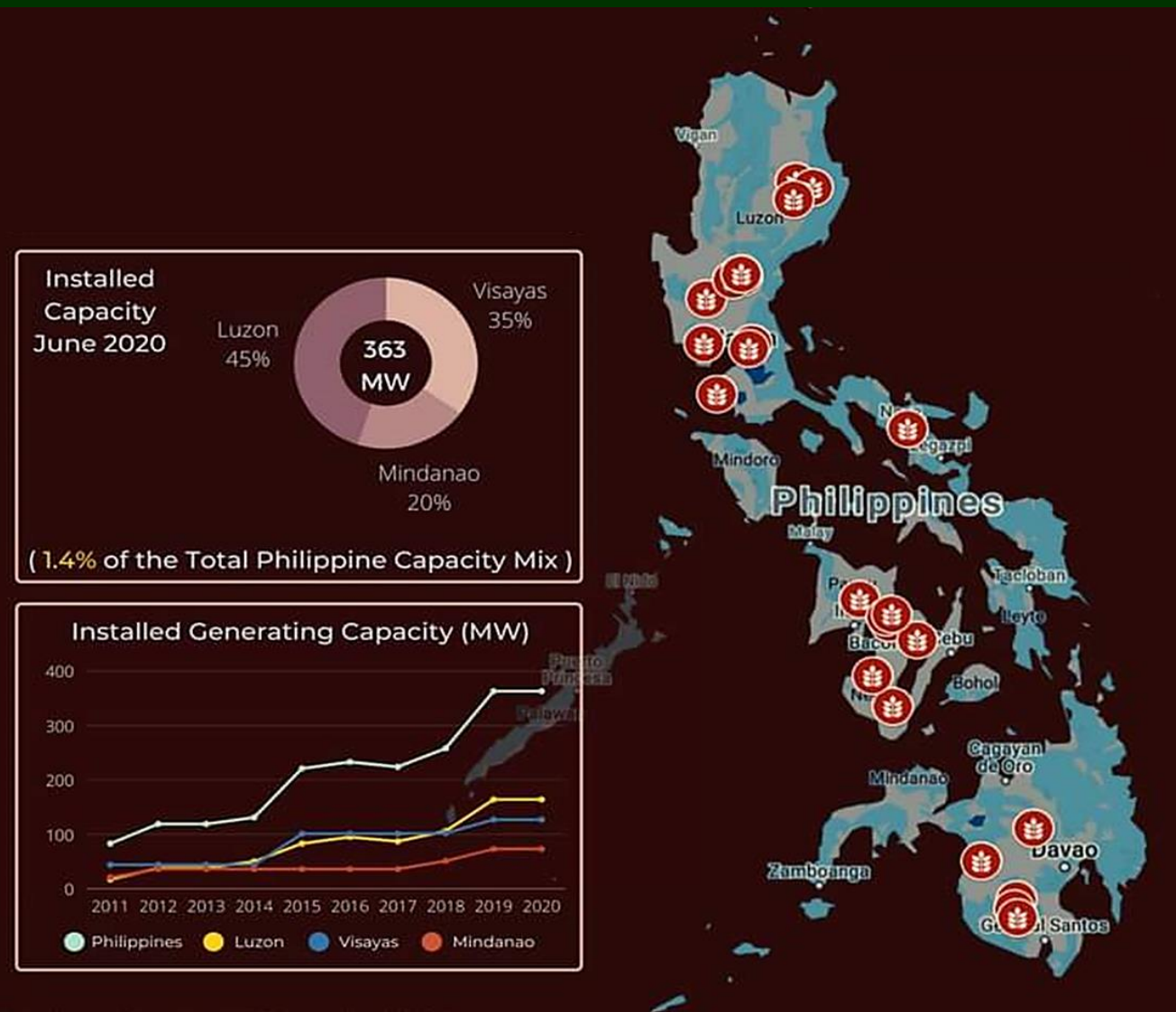
Introduction

Mindanao is the second largest island of the Philippines with a total land area of 102,022 km² composed of 6 regions, 33 cities and 27 provinces.



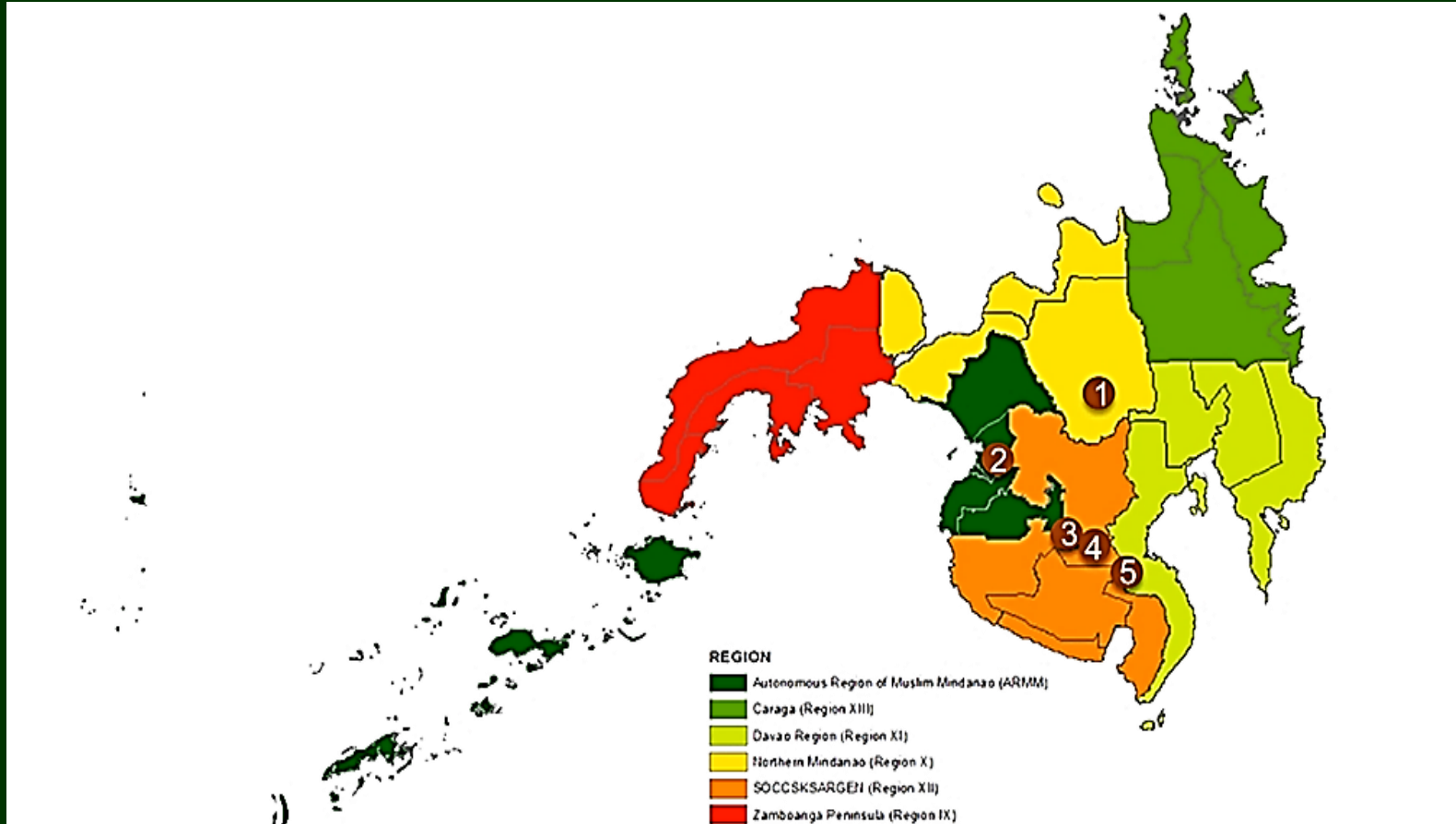
Introduction

The Department of Energy (DOE) has awarded 65 biomass power plant projects last March 2020. Of these, twenty-three (23) biomass power plants are already supplying 363 MW which is about 1.4% of the country's total capacity mix. Other biomass power plants are still under developmental stages.



Introduction

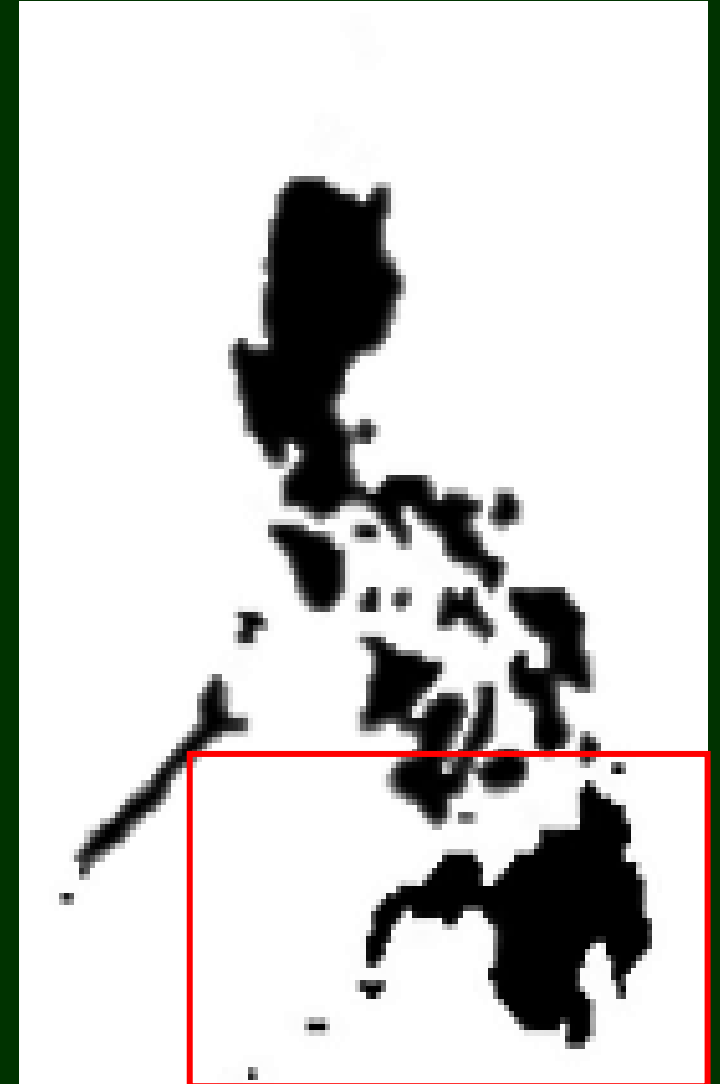
In Mindanao, 5 out of 88 power plants operates on biomass. These power plants are located in central and southern portions of the island.



Facility Name	Location	Subtype	Installed Capacity, MW
1. Crystal Sugar Co., Inc.	Maramag, Bukidnon	Bagasse-fired Cogeneration Plant	35.9
2. Lamsan Power Corp.	Sultan Kudarat, Maguindanao	Bagasse-fired Cogeneration Plant	15
3. Green Earth Enersource Corporation (GEEC)	Buluang, Maguindanao	Biomass Cogeneration Plant	3.5
4. Biotech Farms, Inc. (BFI)	Tantangang, South Cotabato	Biomass Cogeneration Power Plant	5.96
5. Biotech Farms, Inc. (BFI)	Banga, South Cotabato	Biogas Power Plant	12.39

Introduction

Mindanao is a fast-growing island in the Philippines in terms of agriculture, and industry. Biomass energy is a potentially clean and sustainable alternative energy source. There is currently no available data on Mindanao's biomass energy potential and the location of the various residues for biomass processing.



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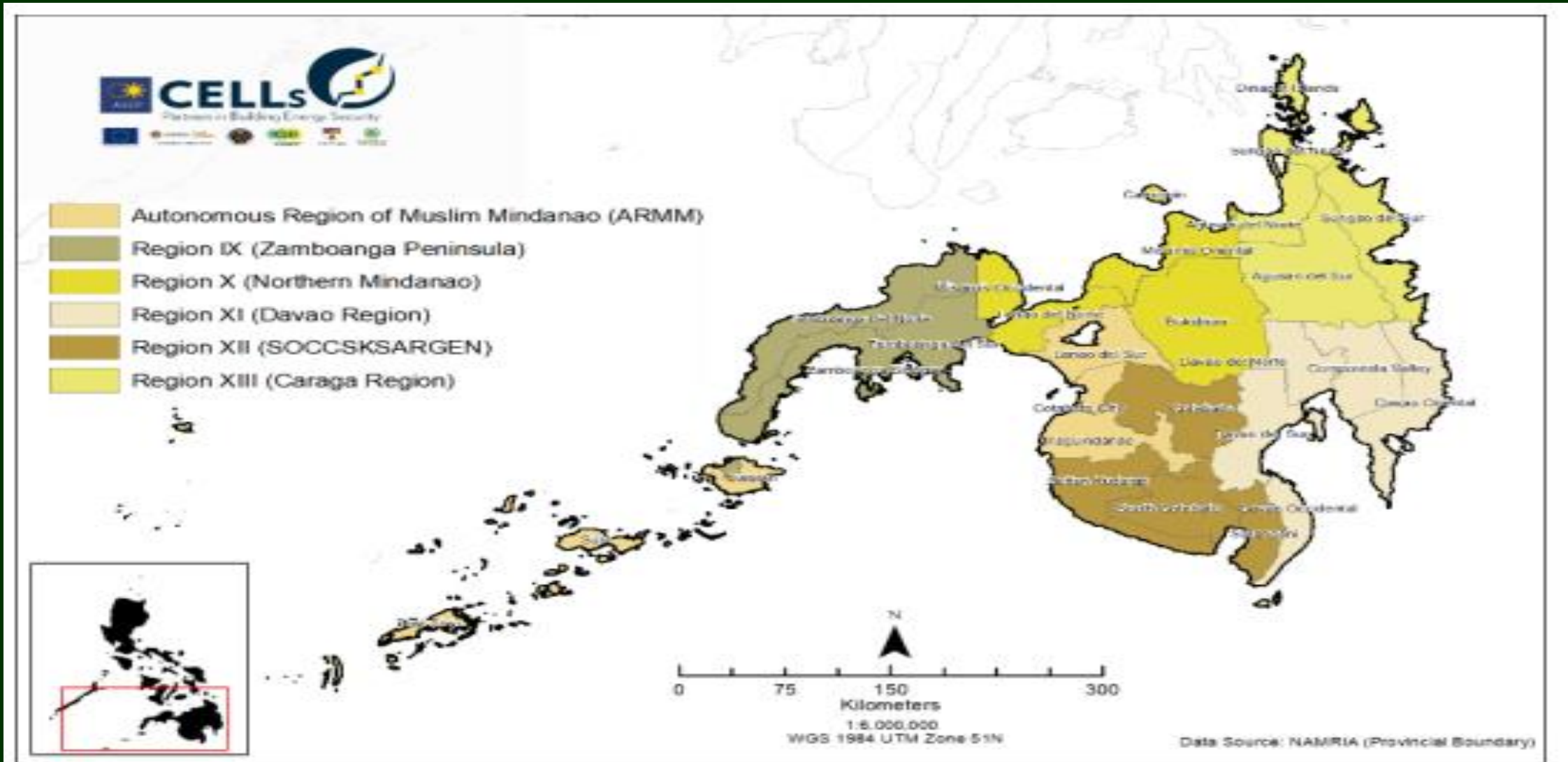


Figure E8.0.1 Political map of Mindanao

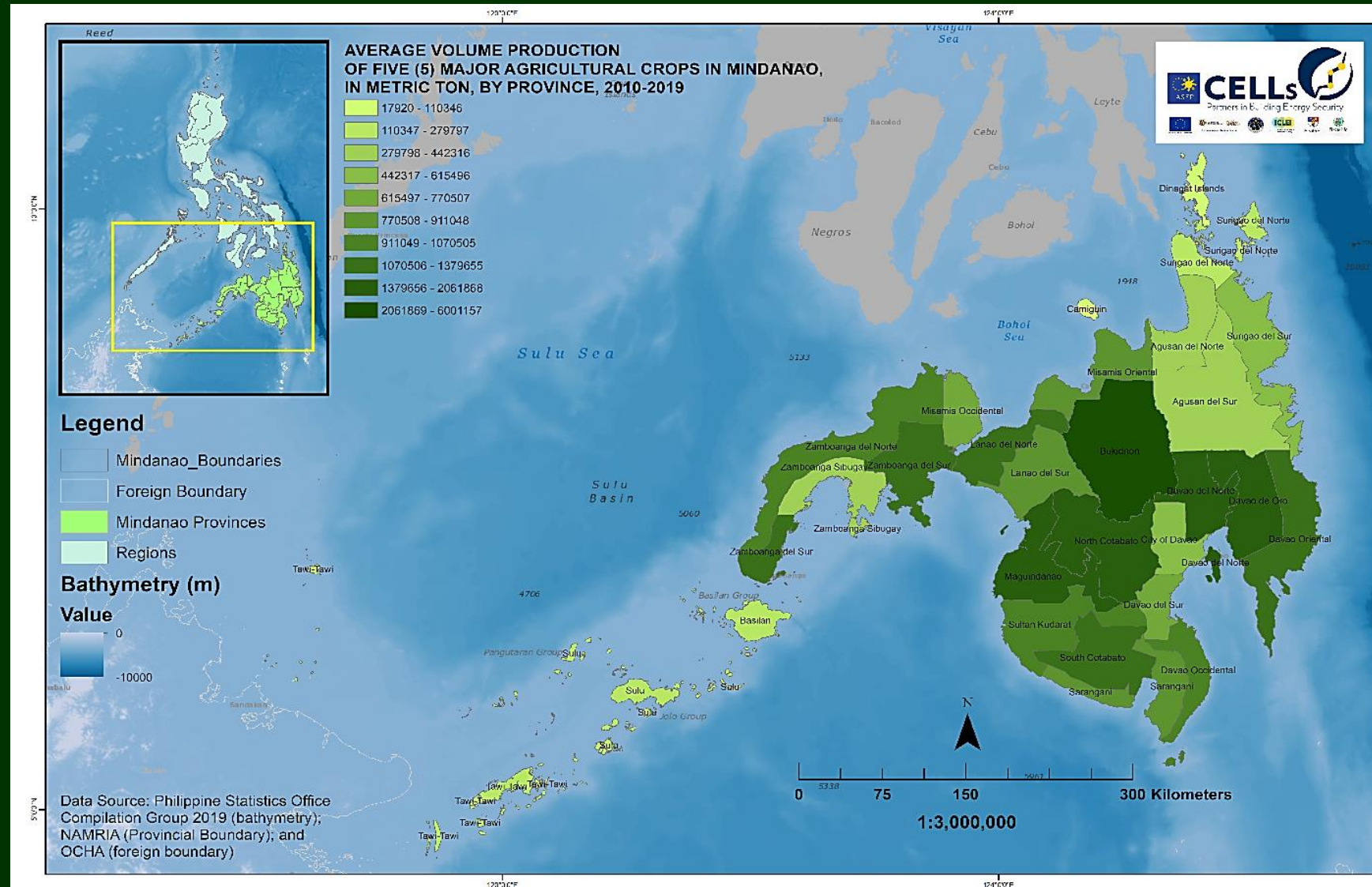
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The main objective of this study is to conduct a biomass resource assessment in Mindanao and analyze it using a graphical information system (GIS) and remote sensing.

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Mapping
Technologies /
Remote
Sensing
Platforms for
Biomass.



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Assessment of Mindanao Biomass Energy Potential using Graphical Information System (GIS) Technology.

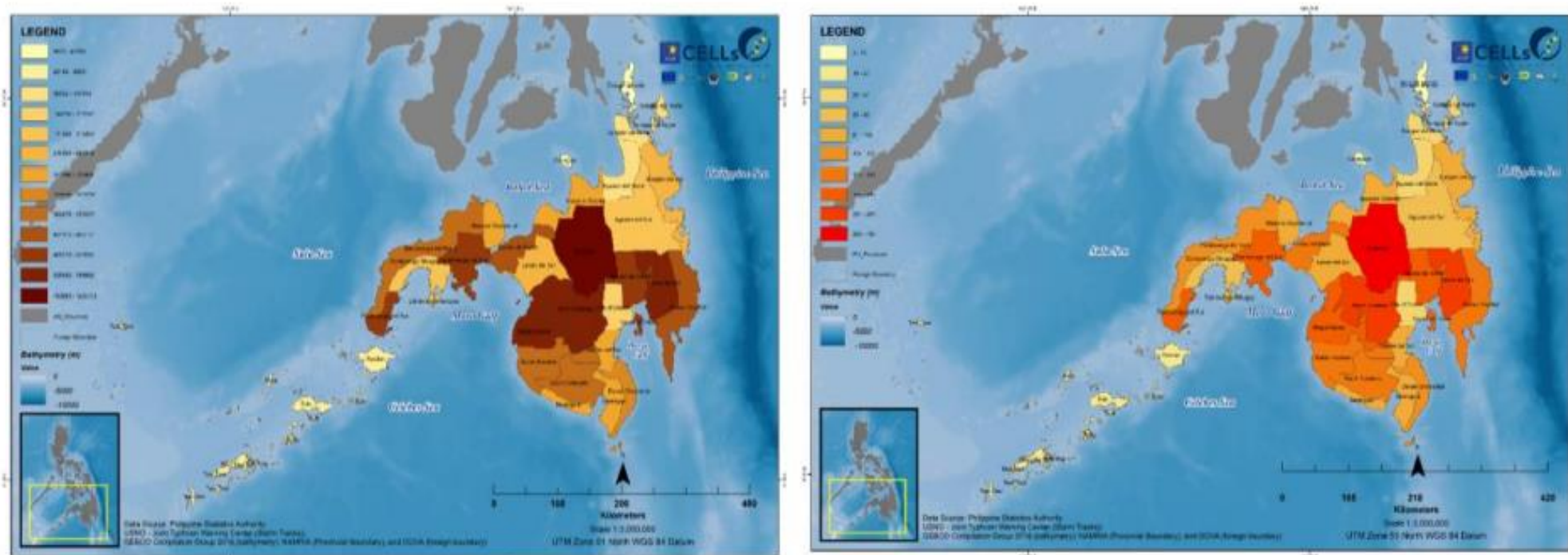
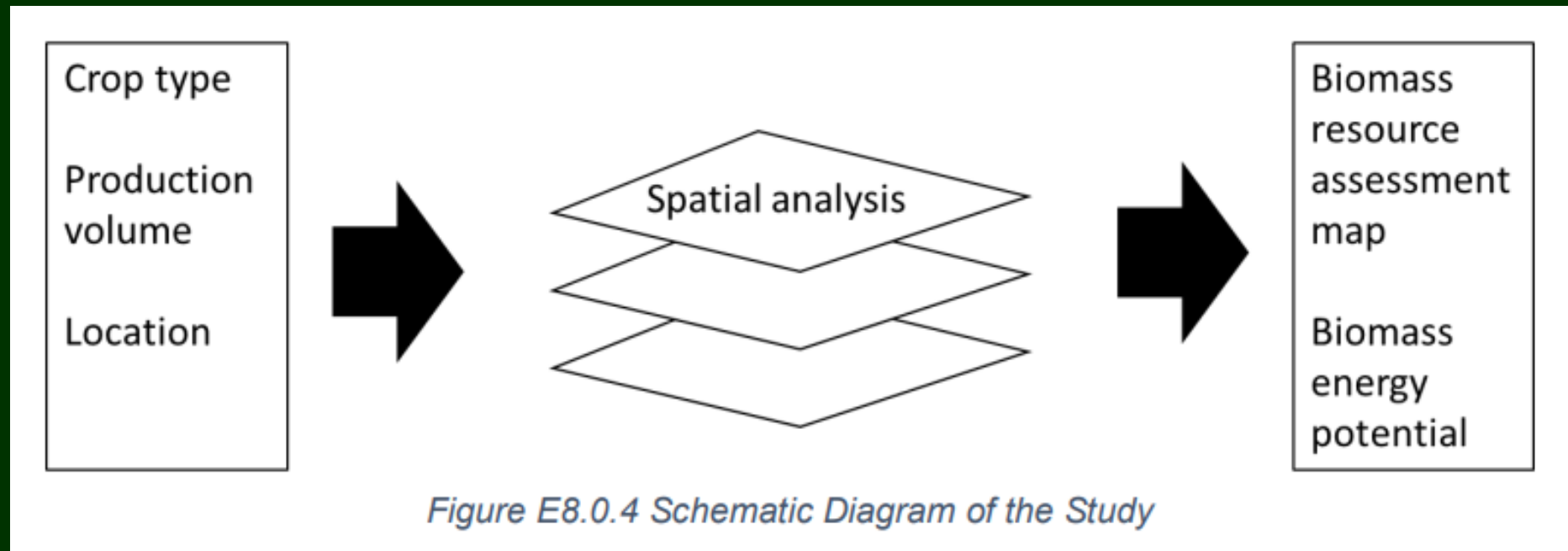


Figure E8.0.5 Map of estimated volume of biomass residues (in Metric Ton) and estimated biomass energy potential (in Megawatts) from five (5) major crops in Mindanao, by Province, 2019

Conceptual Framework

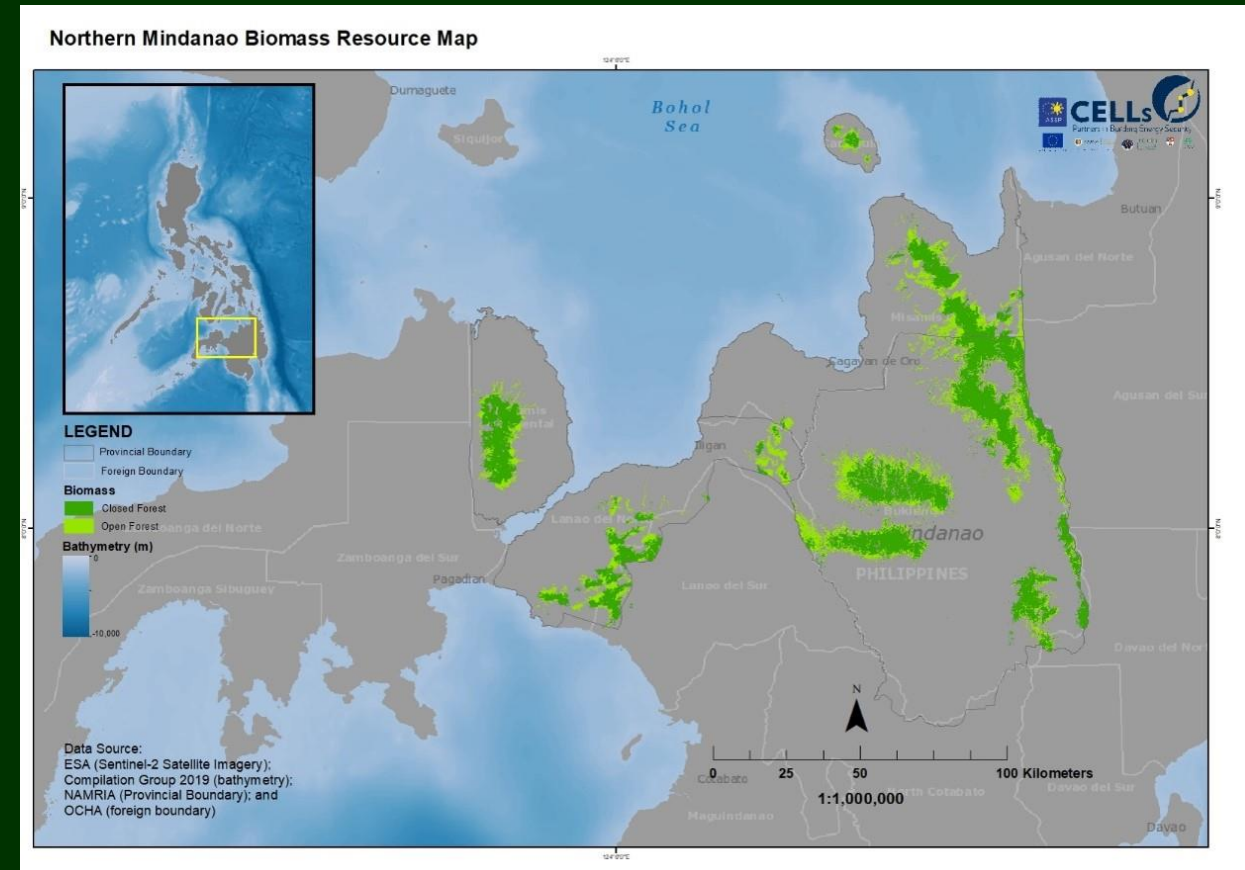
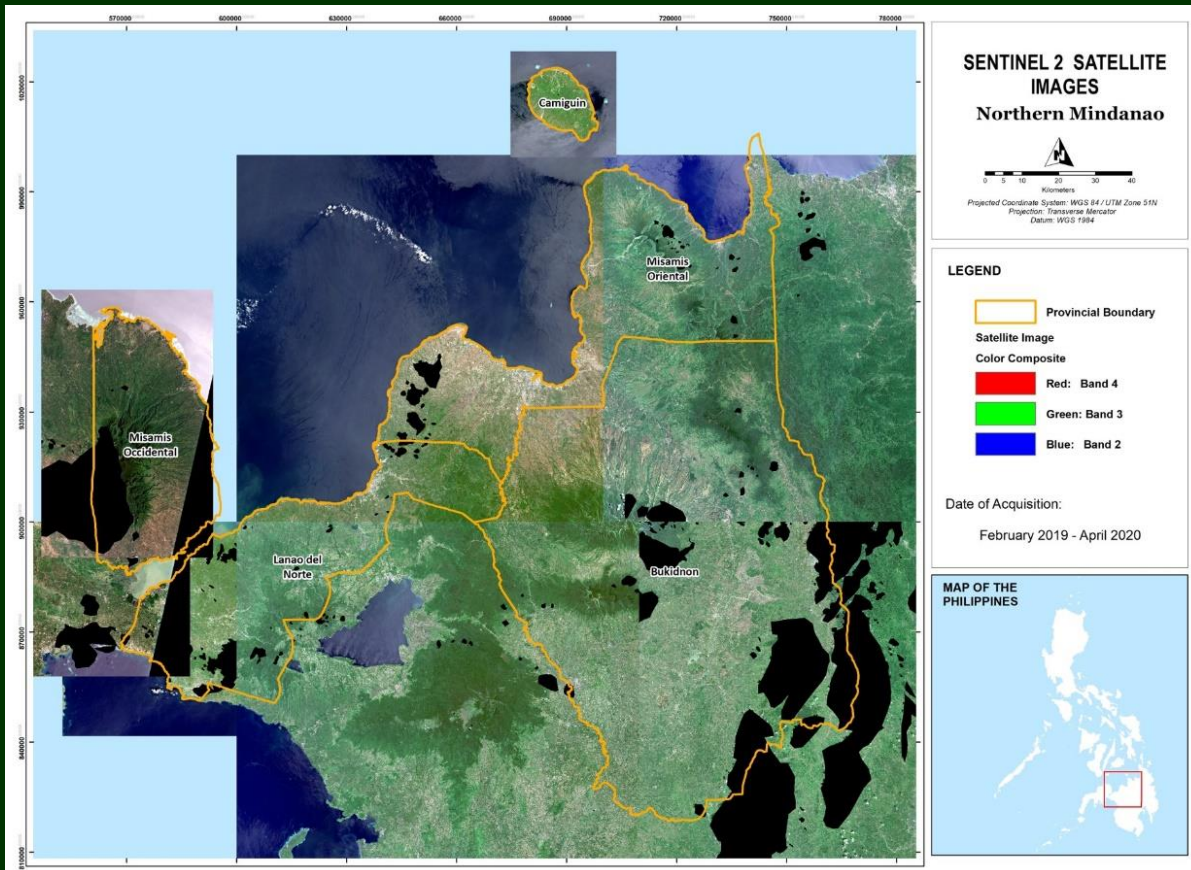
To assess the viability of installing a biomass power plant, it is important to determine the availability of biomass by quantifying the volume of target materials and the energy that may be produced.



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Remote Sensing and Land Use Mapping



Mindanao is the second largest contributor of agricultural products in the country mainly in crops as presented in Figure E8.1.5. The increasing agricultural productivity of Mindanao would increase the amount of residues that could be used as feedstock for biomass power plants.

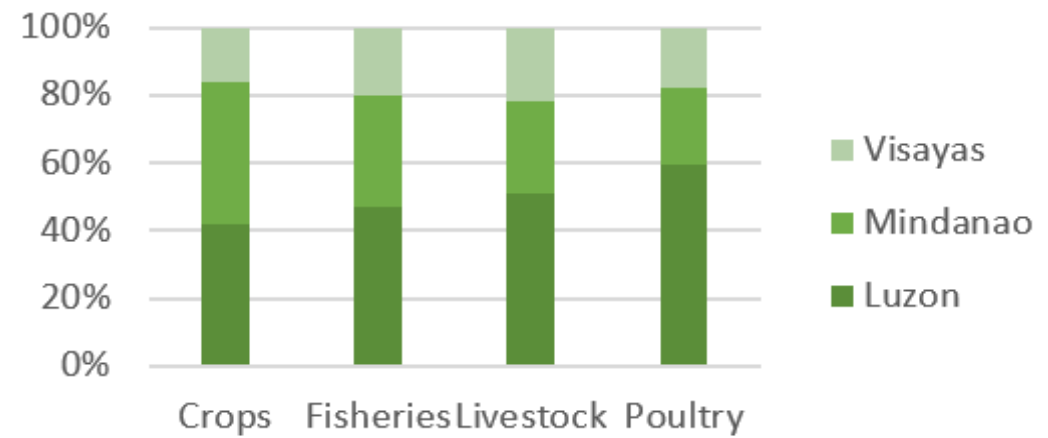
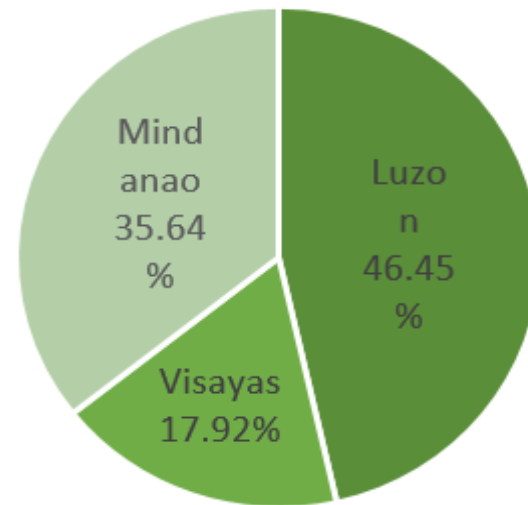
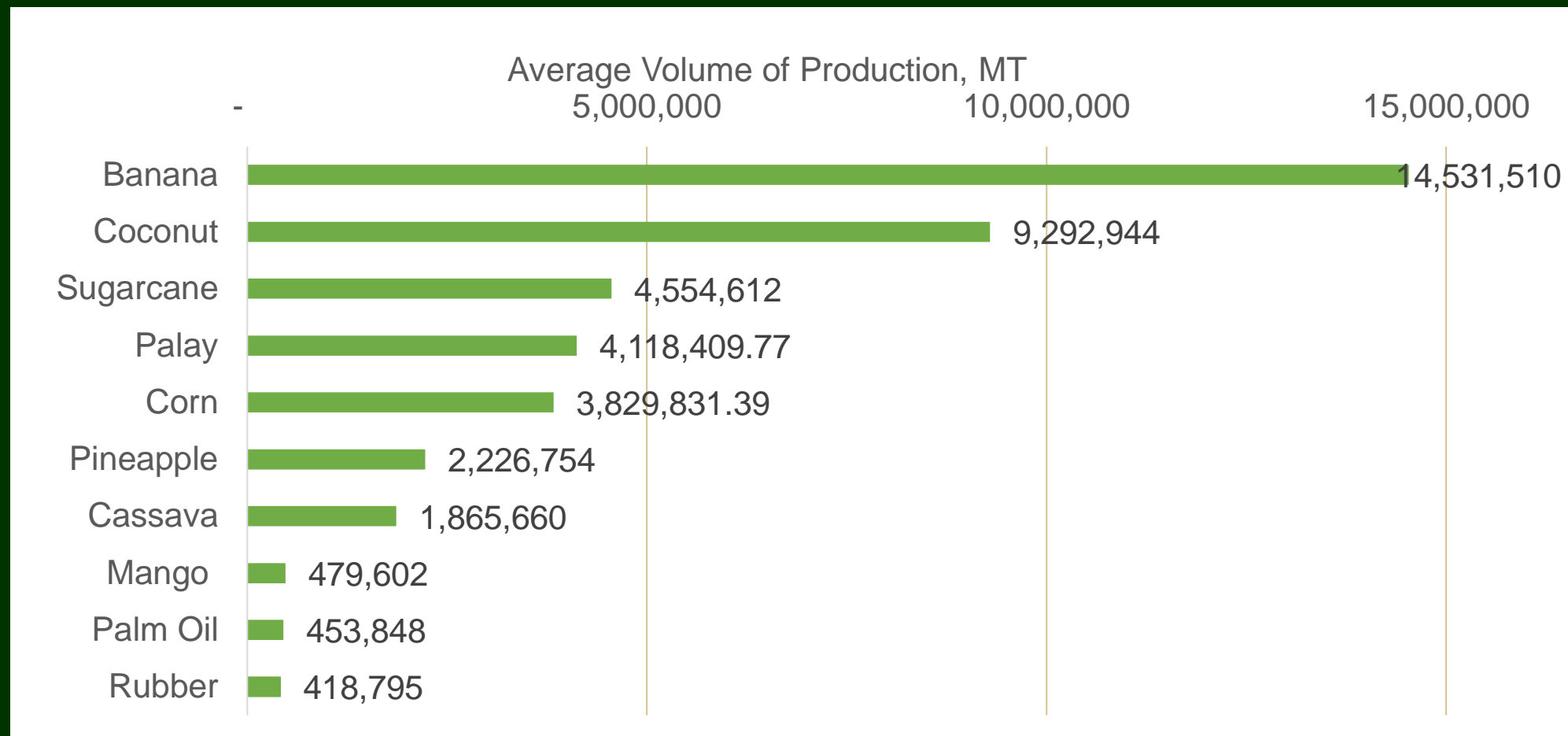


Figure E8.1.5 Percentage Share in Total Value of Production in Agriculture 2020, By Major Island Group, At Constant 2018 Prices

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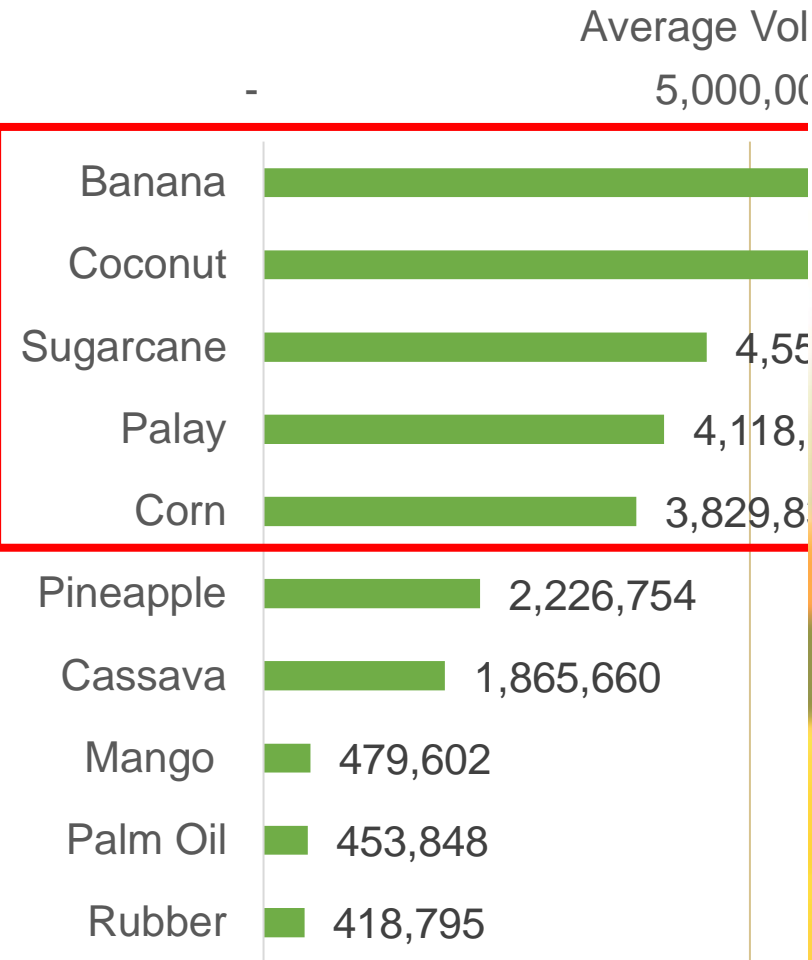
The ten major crops of Mindanao based on the volume of production are...



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Mindanao's Five Major Crops



BIOMASS ENERGY POTENTIAL IN MINDANAO IDENTIFIED 5 MAJOR CROPS IN MINDANAO

COCONUT
9,292,944
METRIC TONS
ZAMBOANGA DEL NORTE,
DAVAO OCCIDENTAL,
DAVAO DEL NORTE



SUGARCANE
4,554,612
METRIC TONS
BUKIDNON, DAVAO DEL NORTE,
NORTH COTABATO

PALAY
4,118,410
METRIC TONS
BUKIDNON, SULTAN
KUDARAT,
NORTH COTABATO

BANANA
14,531,510
METRIC TONS
BUKIDNON, DAVAO DE ORO,
NORTH COTABATO

CORN
3,829,831
METRIC TONS
BUKIDNON, MAGUINDANAO,
SOUTH COTABATO

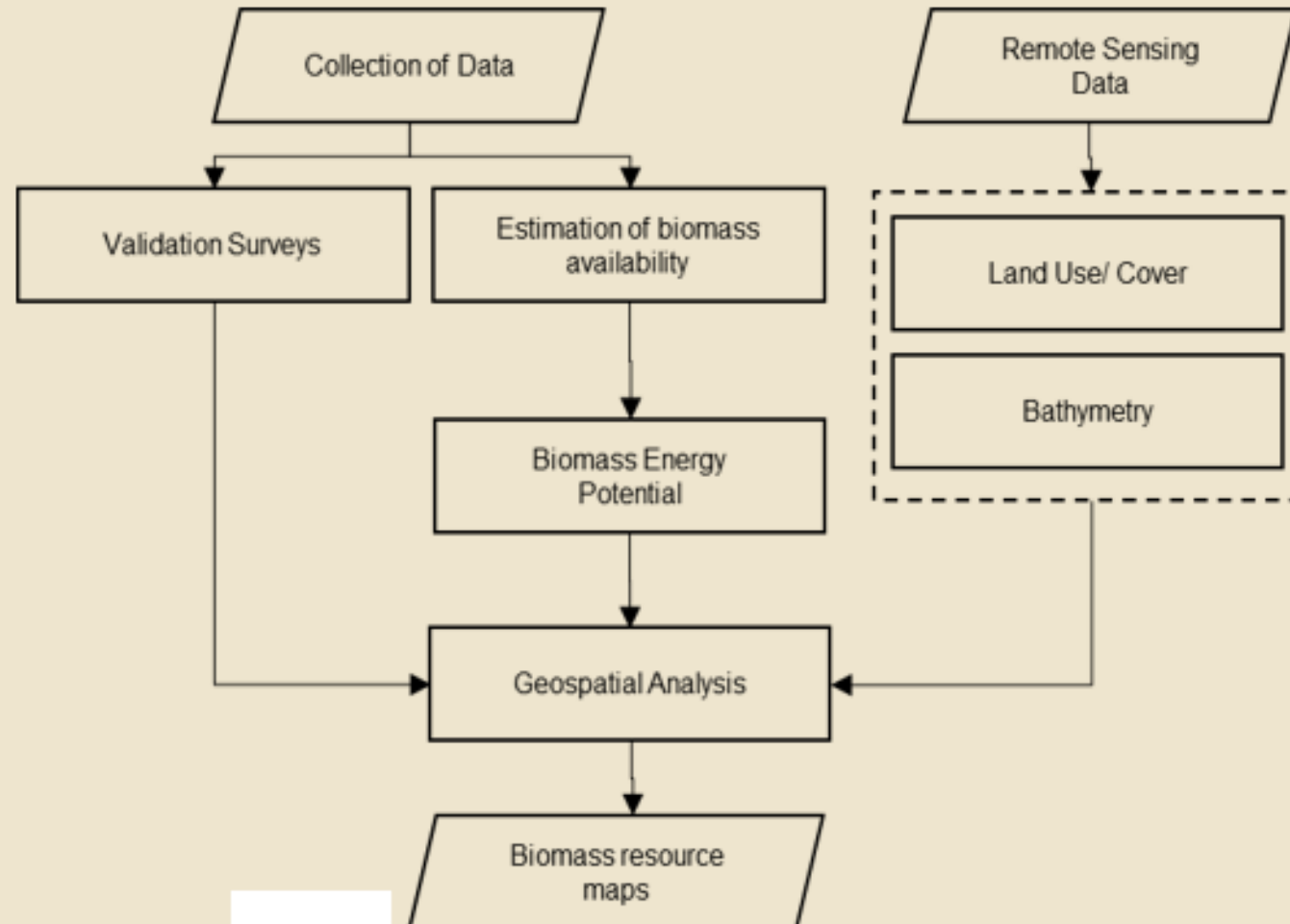
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Mapping Technologies / Remote Sensing Platforms for Biomass.

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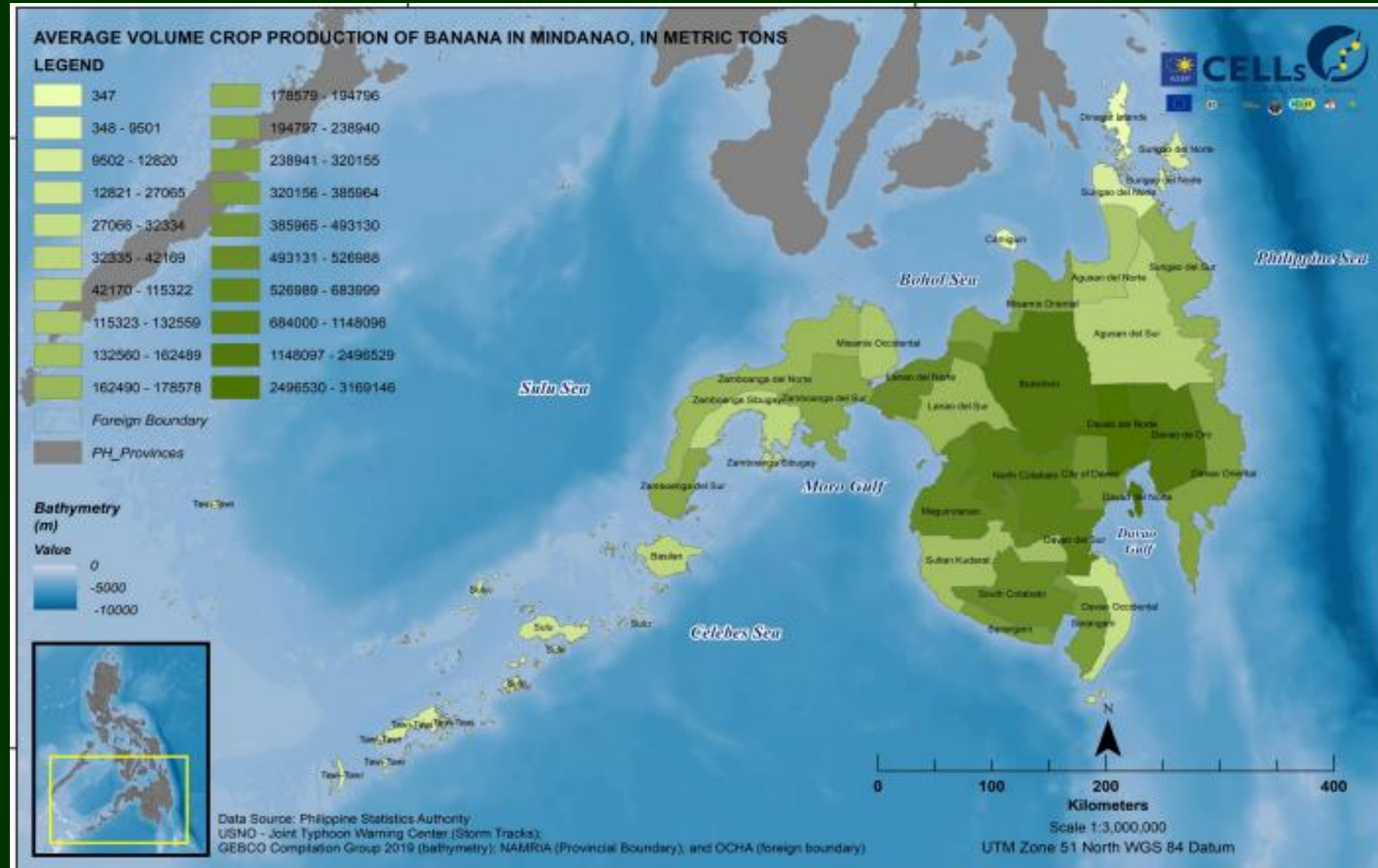
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Process flow for generating biomass resource maps



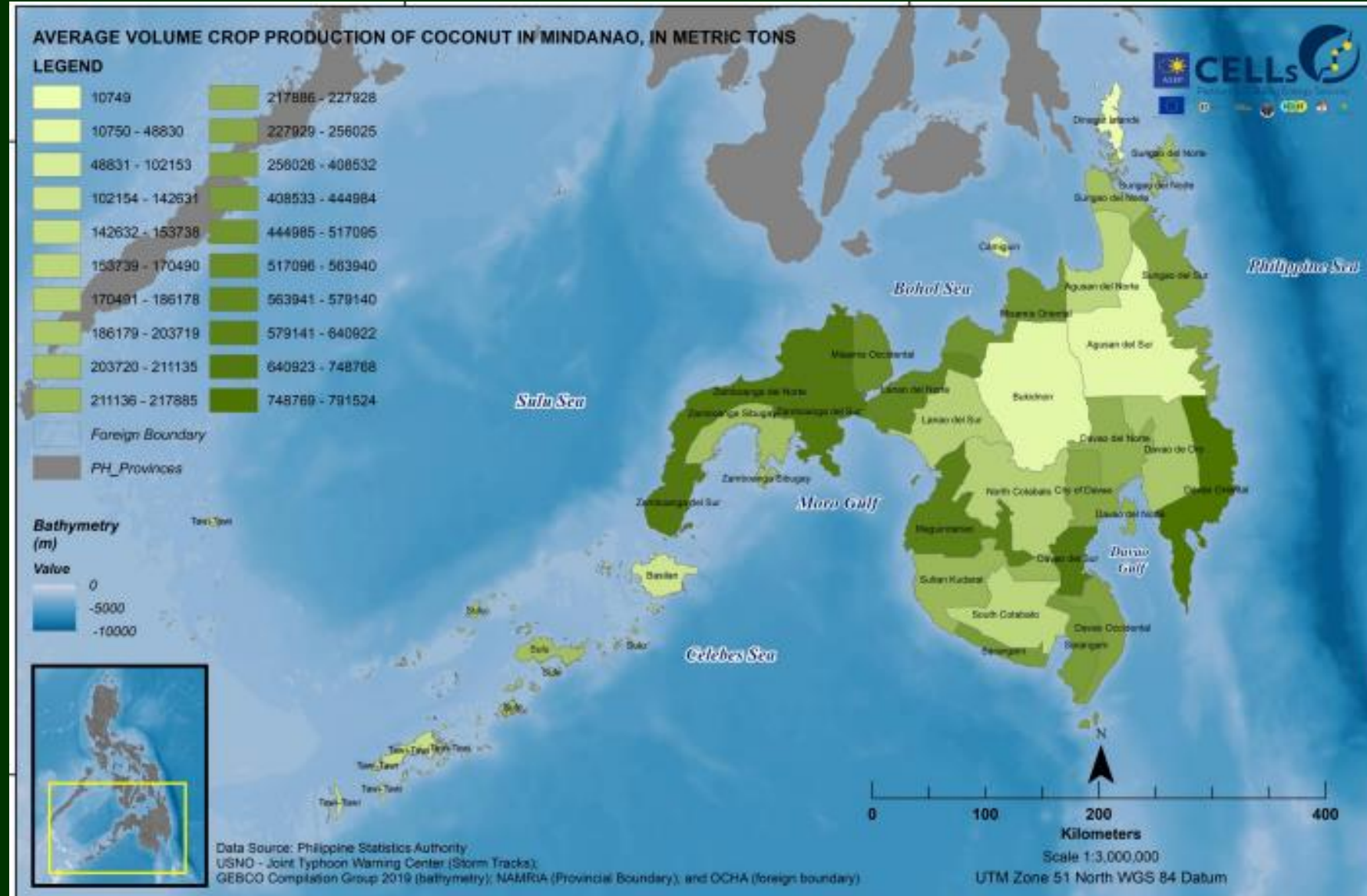
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Quantification of Biomass (Banana) Availability



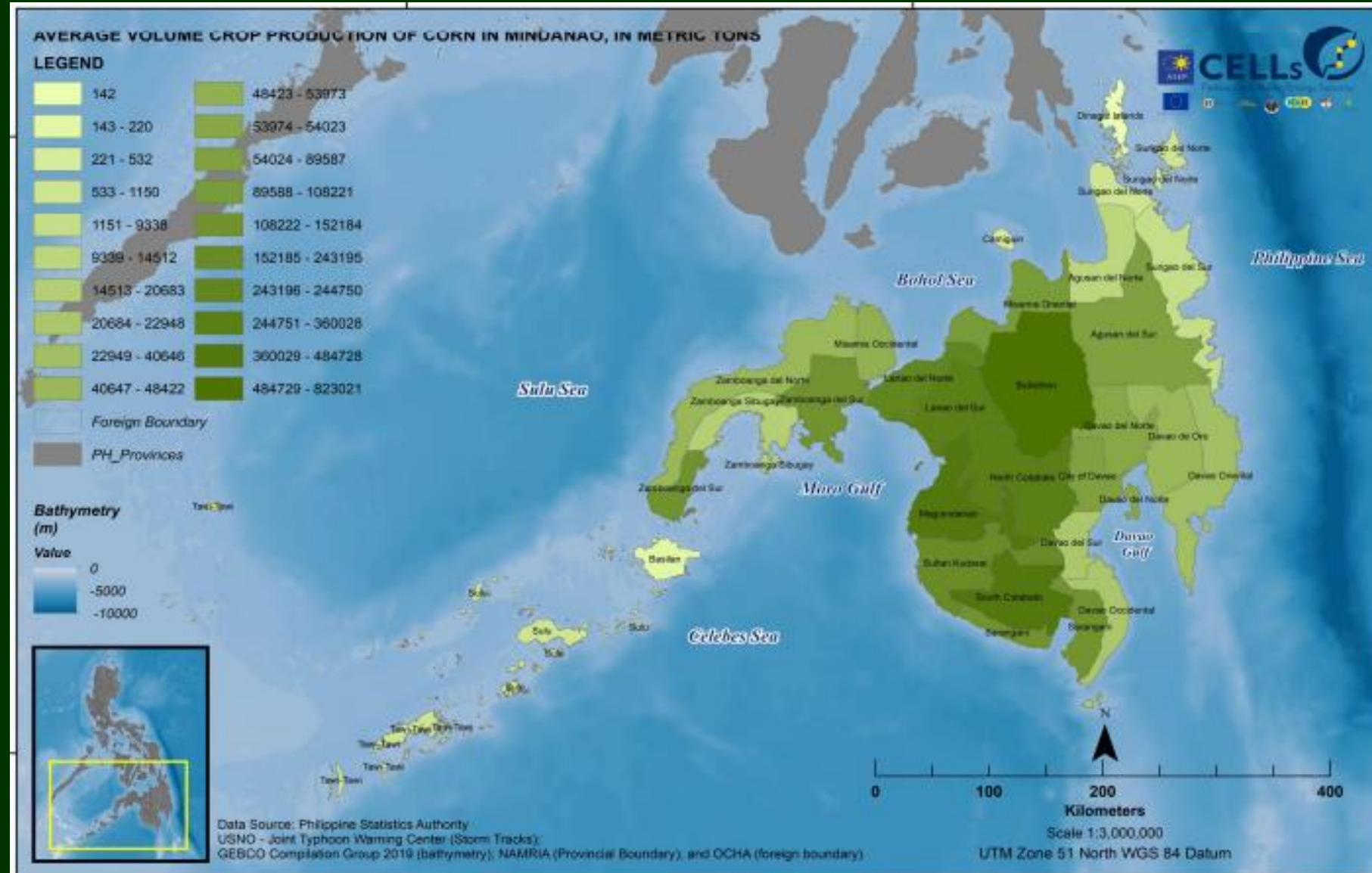
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Quantification of Biomass (Coconut) Availability



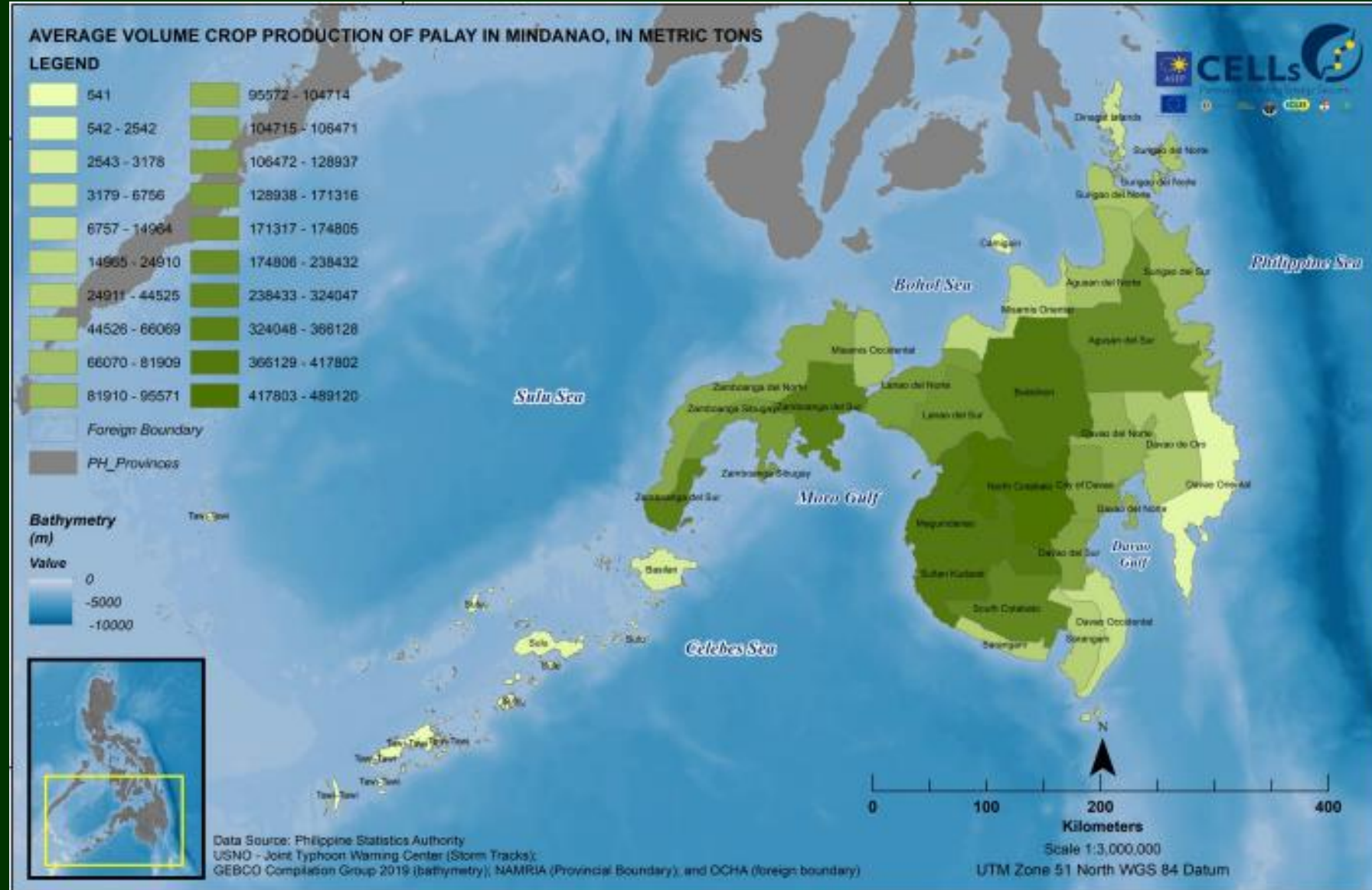
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Quantification of Biomass (Corn) Availability

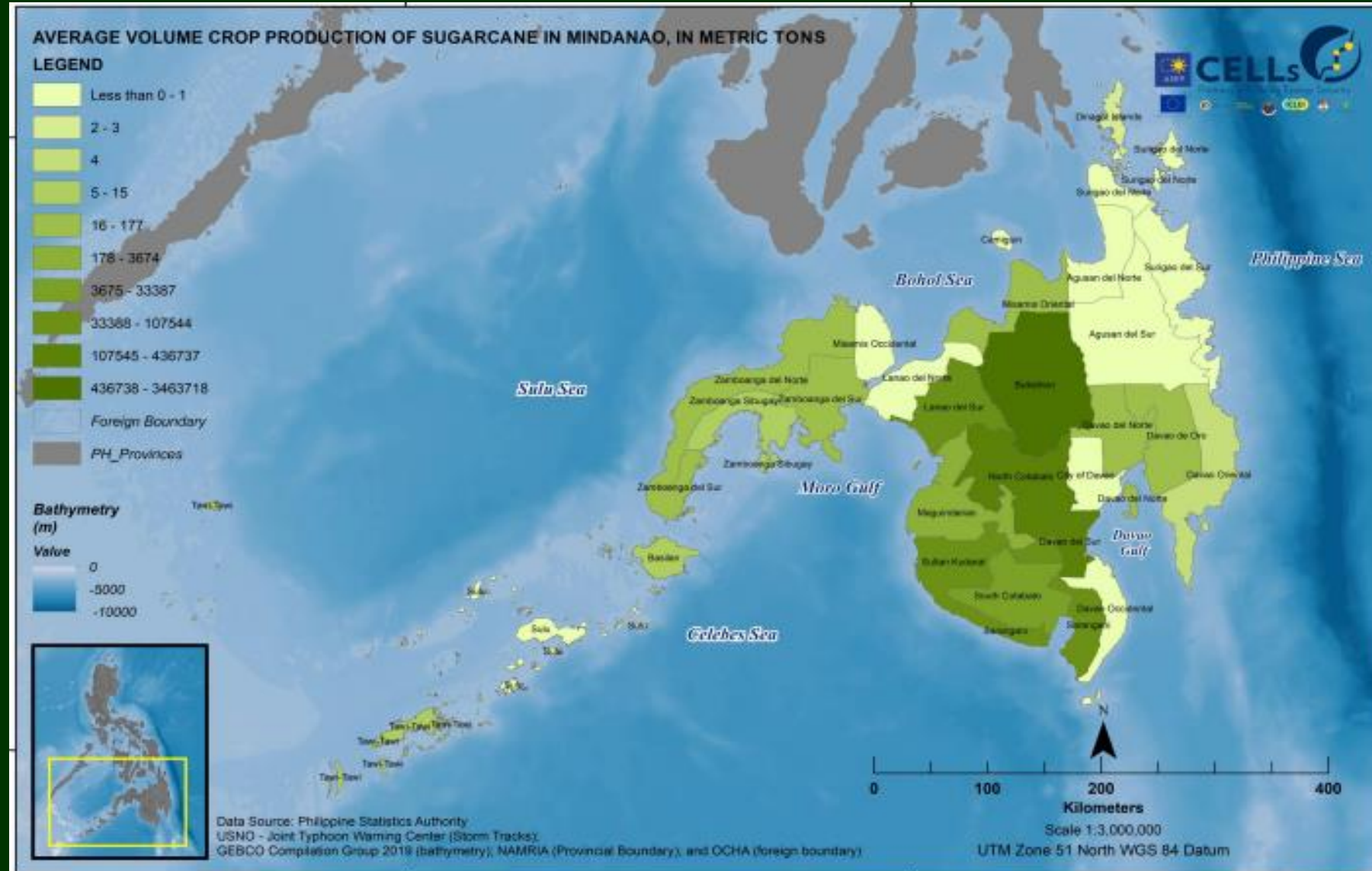


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Quantification of Biomass (Palay) Availability



Quantification
of Biomass
(Sugarcane)
Availability



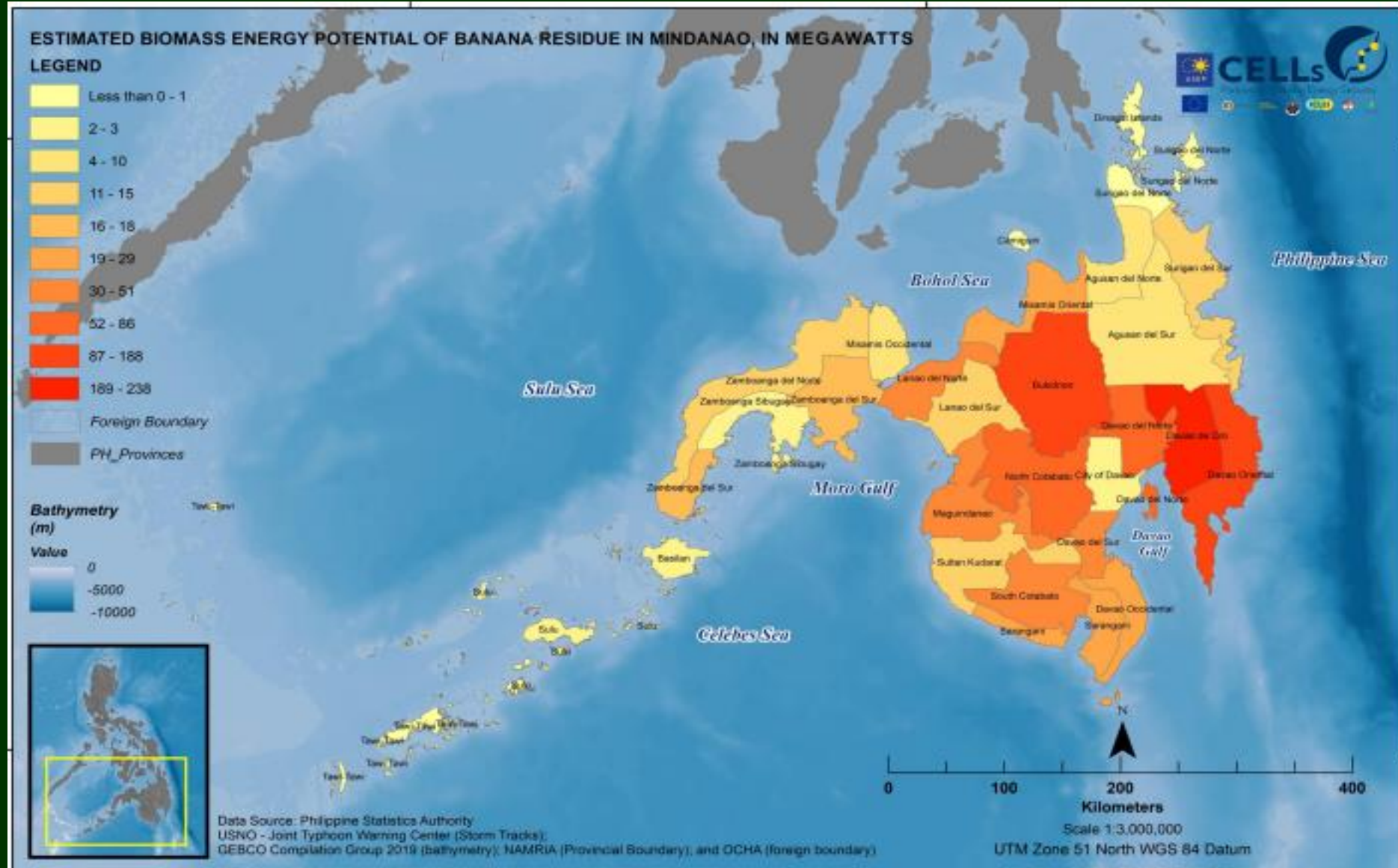
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**Understand the five major crops in
Mindanao and its energy potential using
Graphical Information System (GIS)
Technology.**

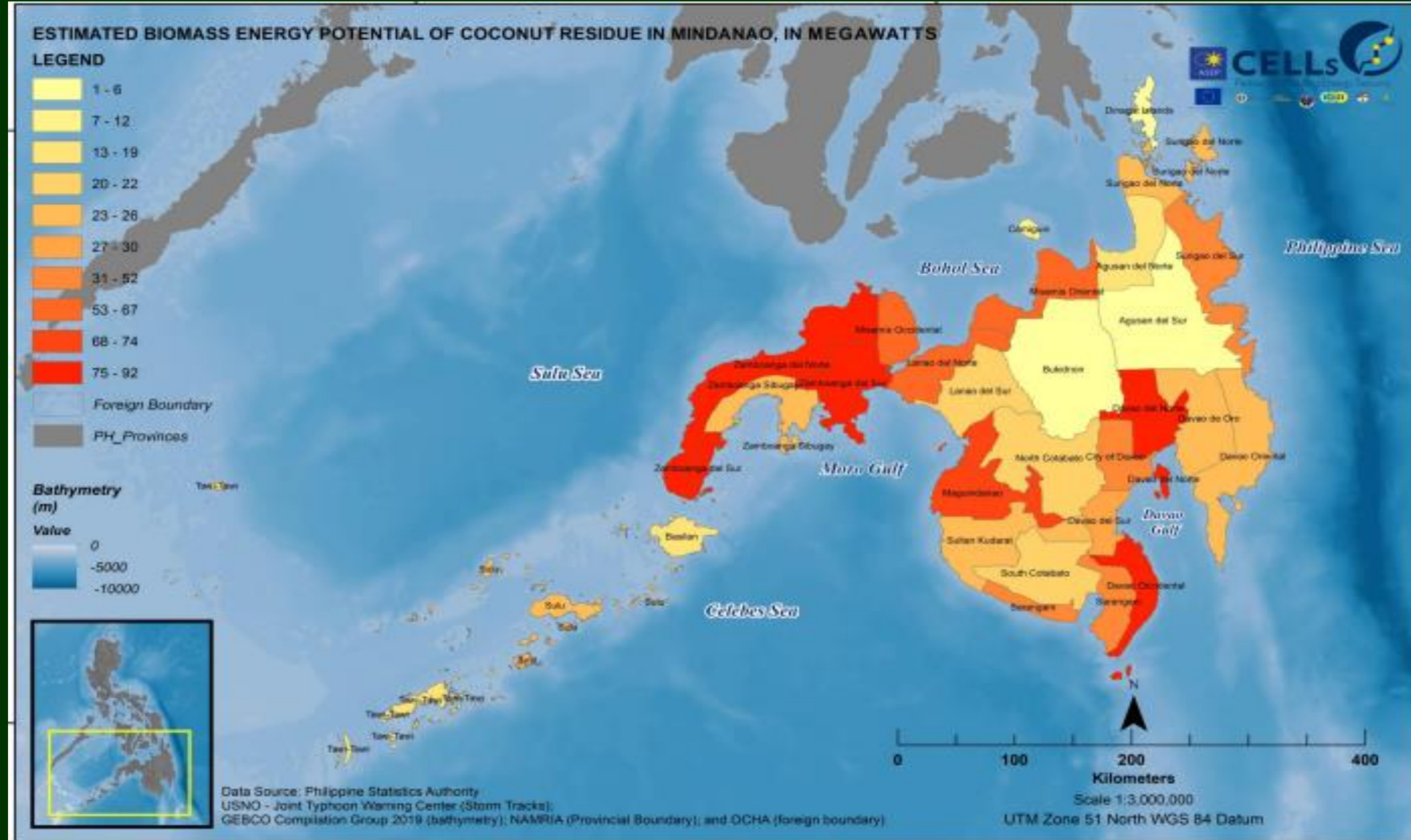
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Biomass Energy Potential of Banana Residue



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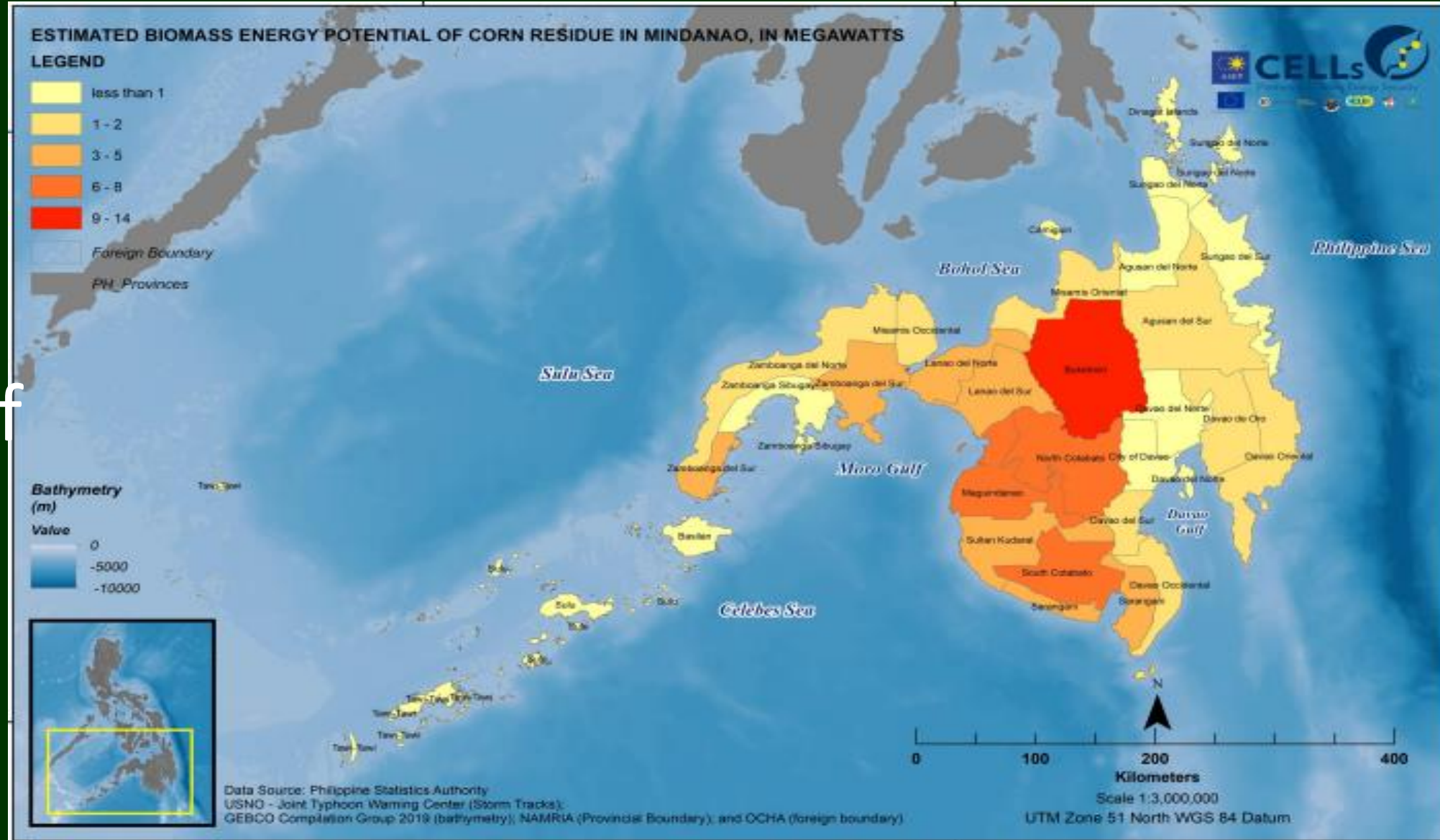
Biomass Energy Potential of Coconut Residue



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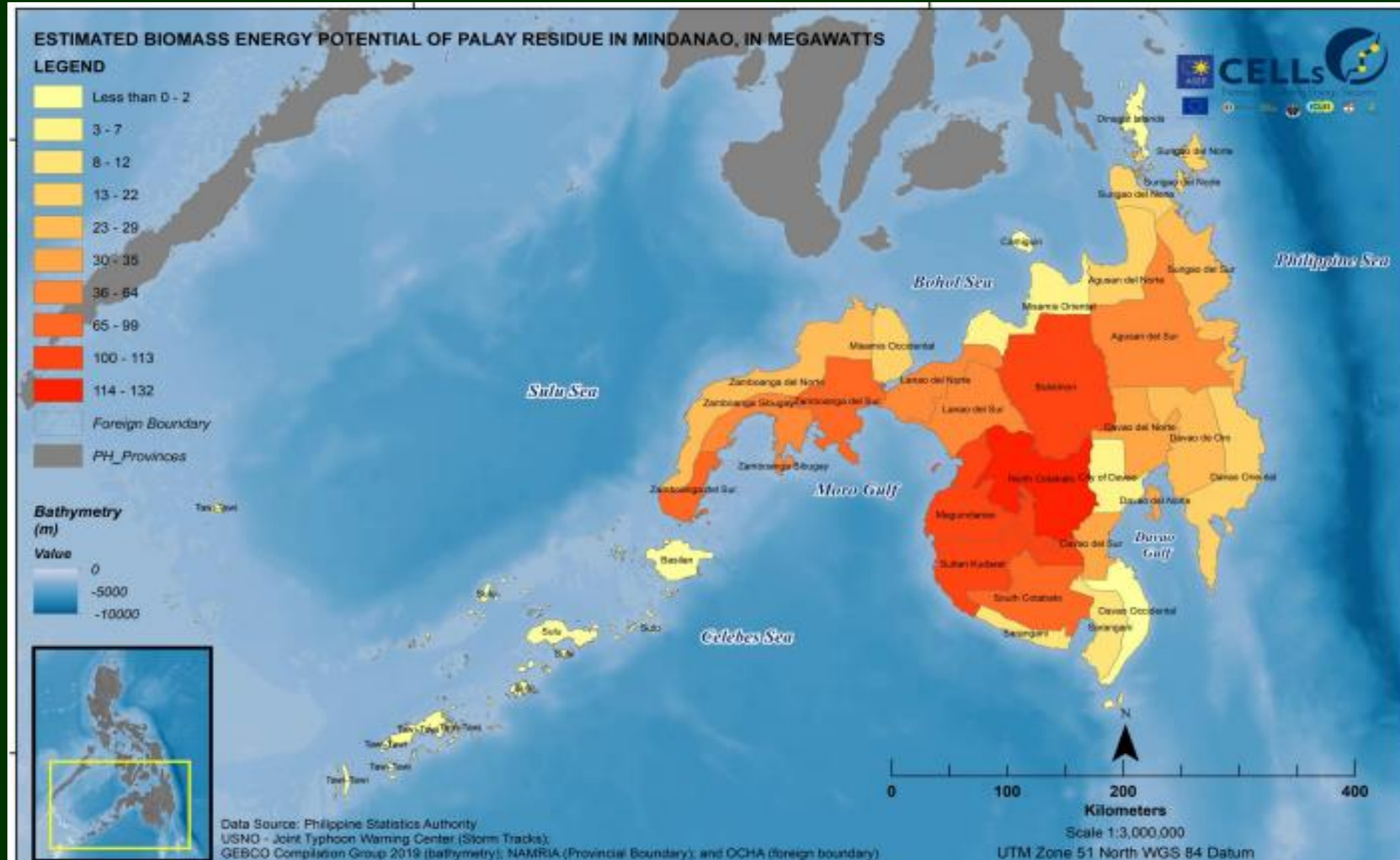
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Biomass Energy Potential of Corn Residue



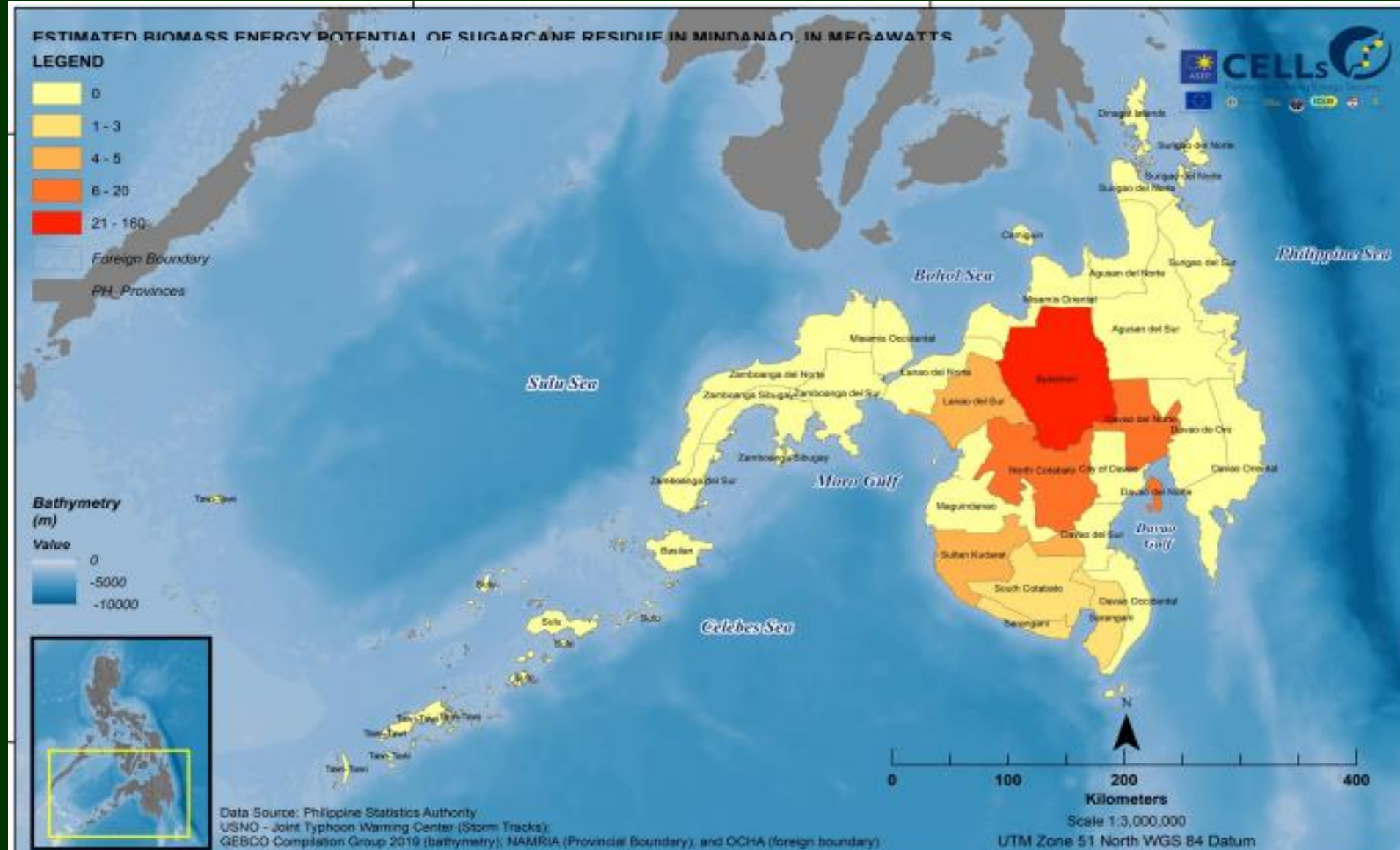
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Biomass Energy Potential of Palay Residue



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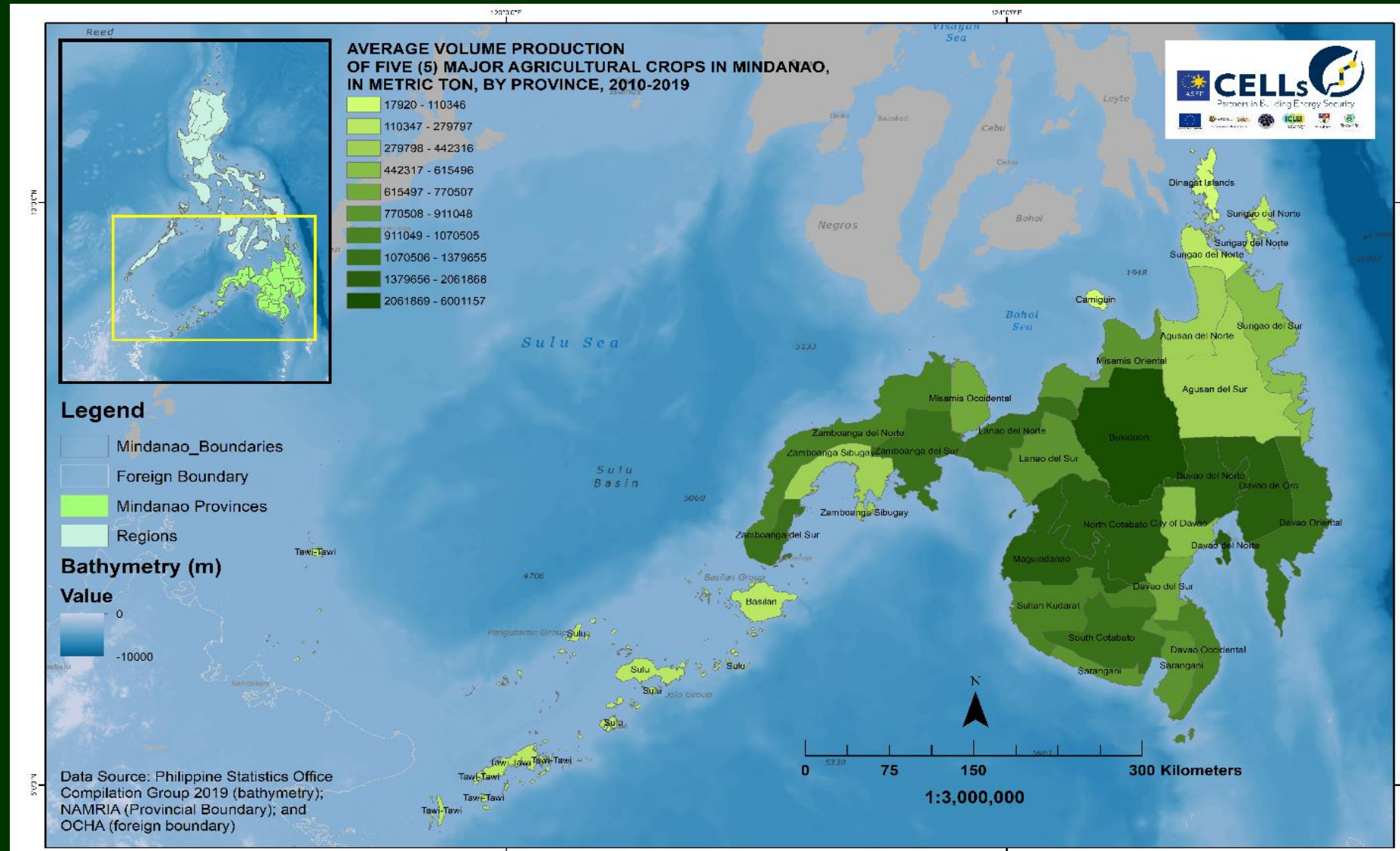
Biomass Energy Potential of Sugarcane Residue



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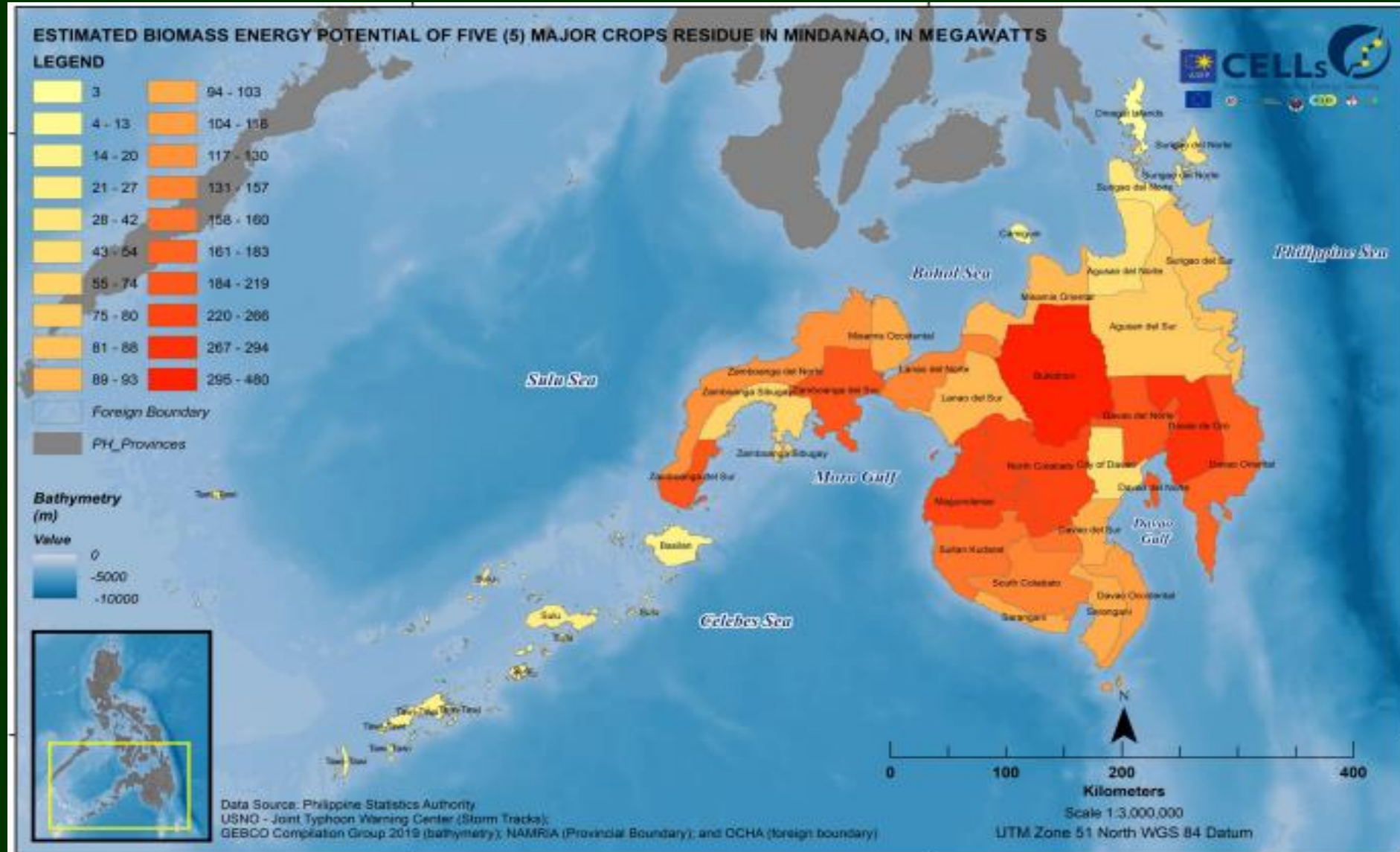
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Quantification of Biomass (5 major crops) Availability



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Quantification of Biomass (5 major crops) Availability



Conclusions

- The results show that Mindanao has ~7.7TWh (~660KTOE) of biomass energy potential. It has the capacity to offset ~81% of its coal consumption in 2019 to generate electricity if biomass is fully utilized. These values translate to potentially ~890 MW of capacity that can be added to the grid at full biomass utilization, which is about 23% of the dependable generating capacity of Mindanao in 2019.
- The province of Bukidnon has the highest volume of biomass residue available for energy production with a total of 1.2 M metric tonnes biomass energy potential with 120 MW assuming 25% of plant efficiency.
- The main biomass resources identified are banana, palay (rice), and coconut. These resources may be used as a substitute for coal in the future.
- Bukidnon, Davao del Norte, and Cotabato are areas of interest for biomass energy generation.

Daghang Salamat!

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