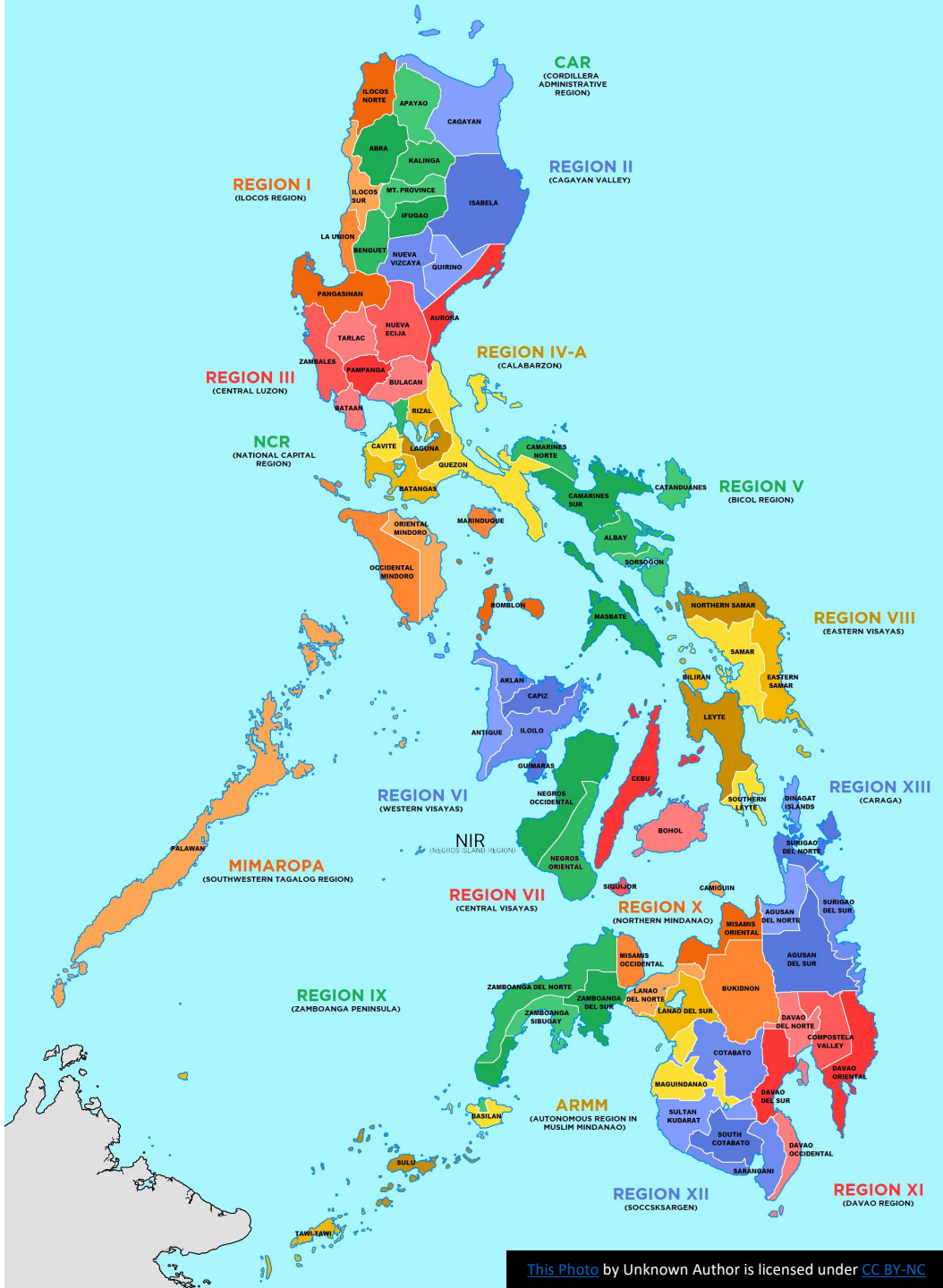
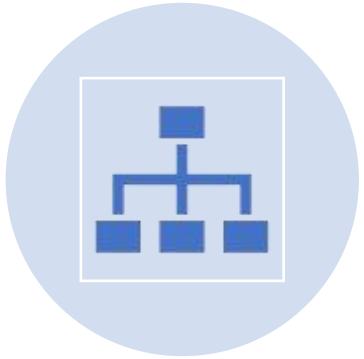
Using Satellite Information for Vulnerability Assessment: Case Study of the Philippines

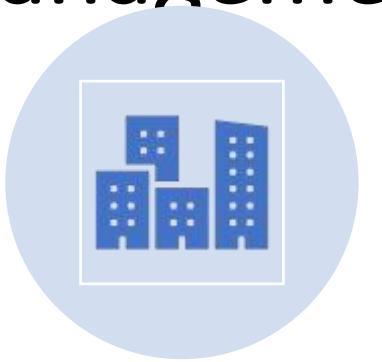
The Philippines

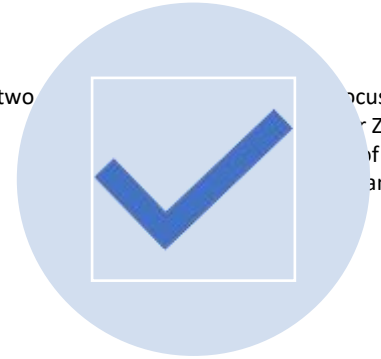
- A country in Southeast Asia
- Composed of 7100 islands (more or less)
- 113.9 M population (2020)
- Capital – Manila
- Ranked 1st in the World Risk Index in 2022



Vulnerability Assessment for Groundwater Management/Planning







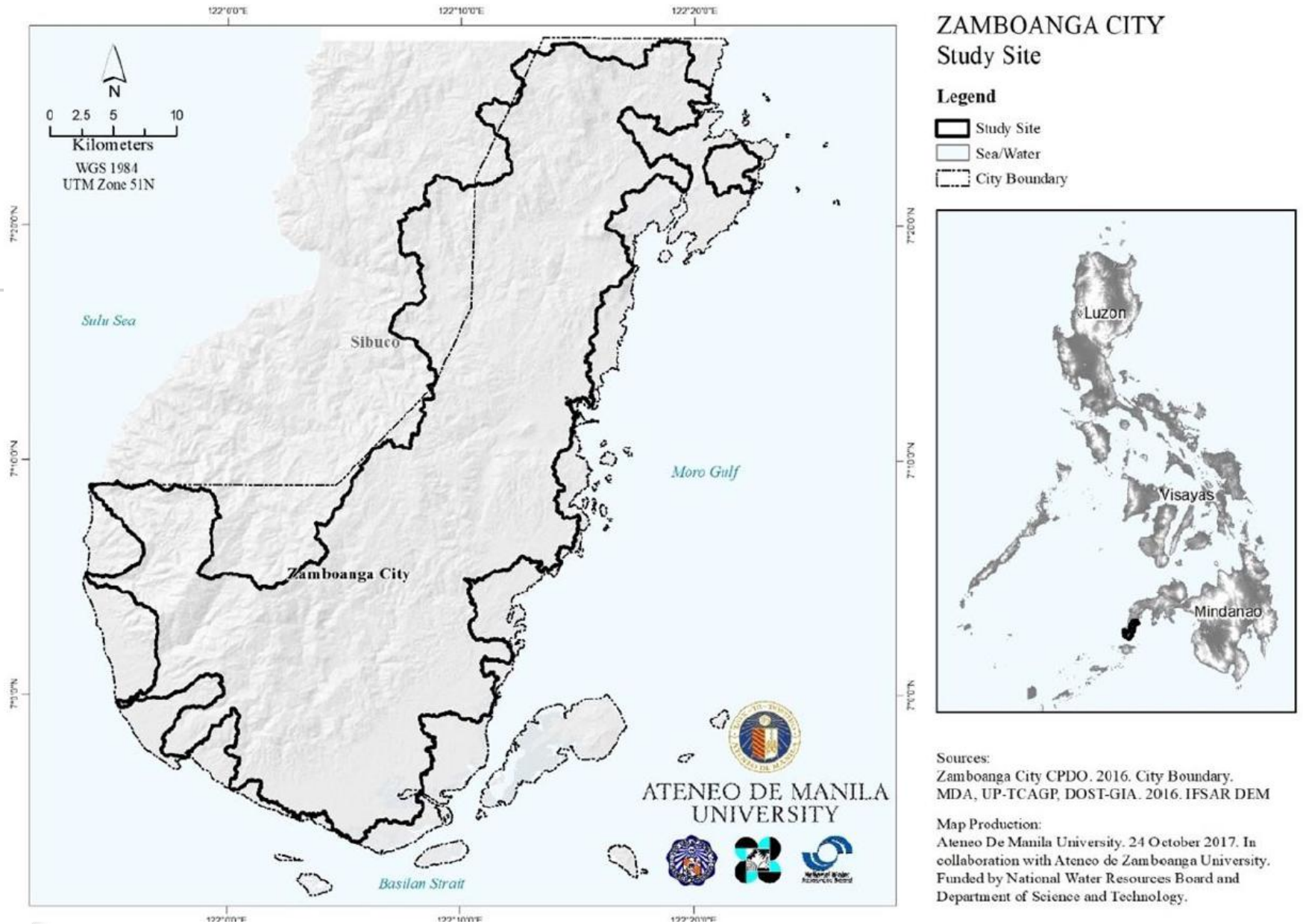
The entire research project was divided into two

ocused on creating a groundwater management
r Zamboanga City by looking at the existing
f Zamboanga's water resources, including an
analysis of its quality and quantity.

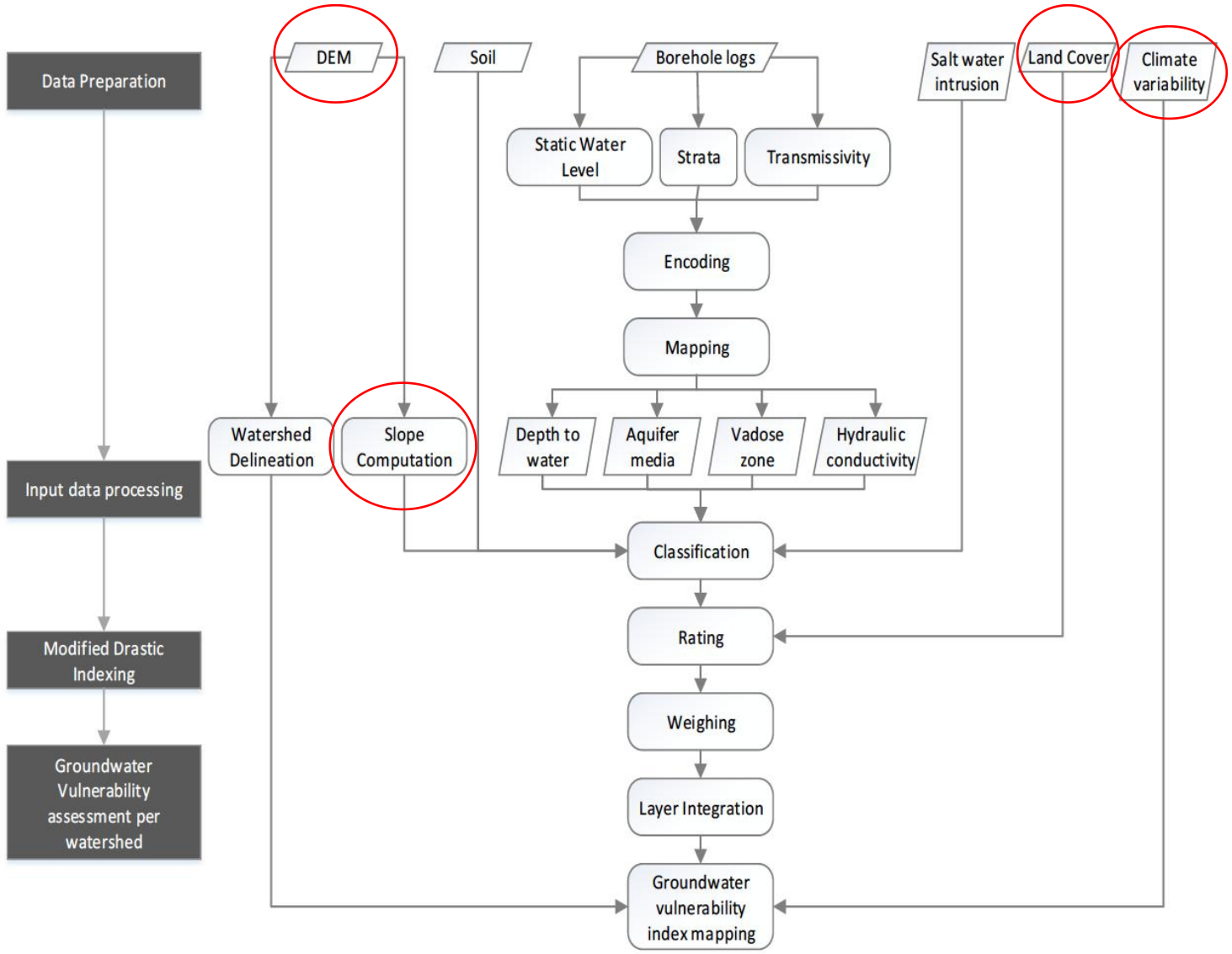
Phase 2 deals with the establishment of ground water monitoring system in the identified vulnerable sites

The Study Site

- Identified as among the 9 critical cities
- Highly urbanized



Methodology



Satellite Imagery

- DEM
- Slope Computation
- Land Cover
- Climate Variability

Modified DRASTIC 2.0

$$VA = 5DR + 3AR + 2SR + 1TR + 5IR + 3CR + 5LUR + 4SWIR + 2RR + 1TR$$

Where,

DR = Depth to water rating

AR = Aquifer rating

SR = Soil rating

TR = Topography rating

IR = Impact of vadose zone rating

CR = Hydraulic conductivity rating

LUR = Land use rating

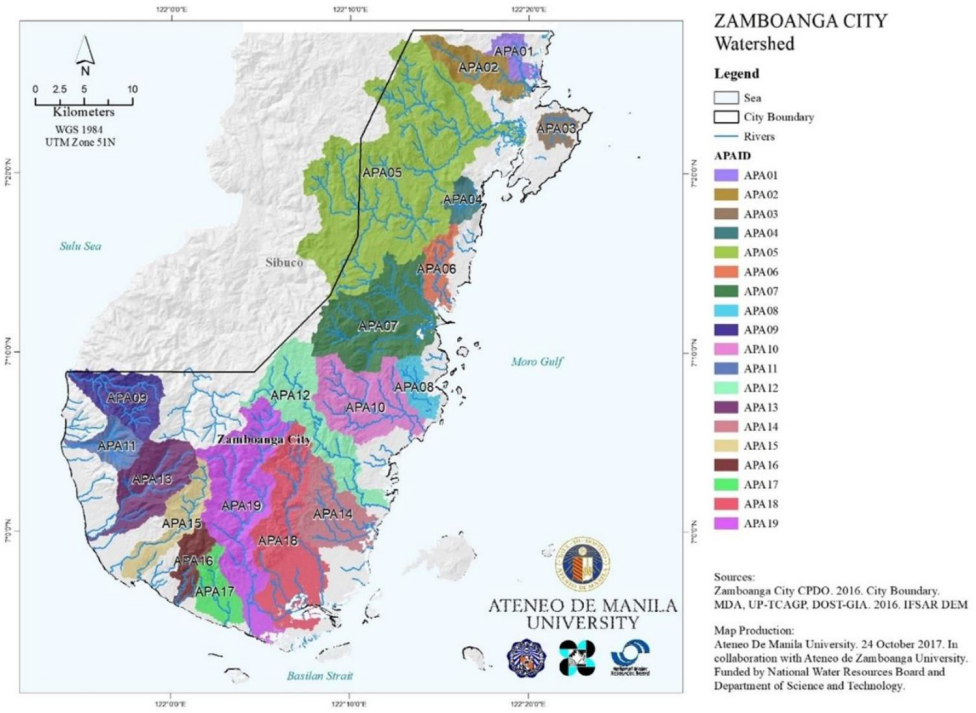
SWIR = Saltwater intrusion rating

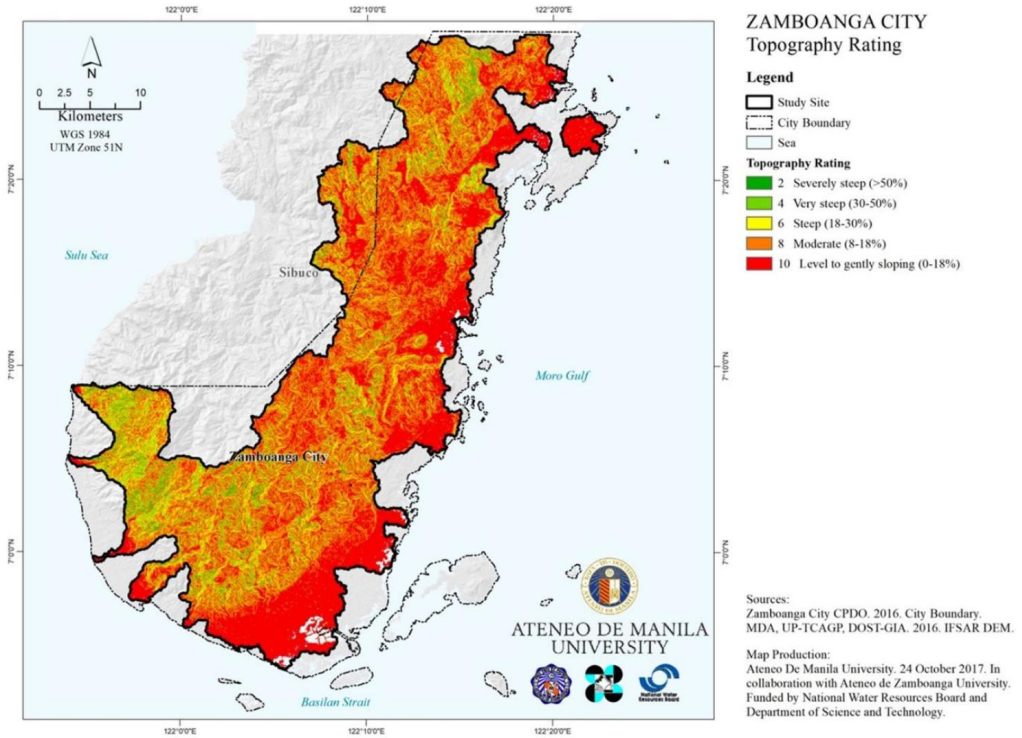
RR = Projected rainfall rating (Year 2020, 2050)

TR = Projected temperature rating (Year 2020, 2050)

Watershed Delineation Using DEM

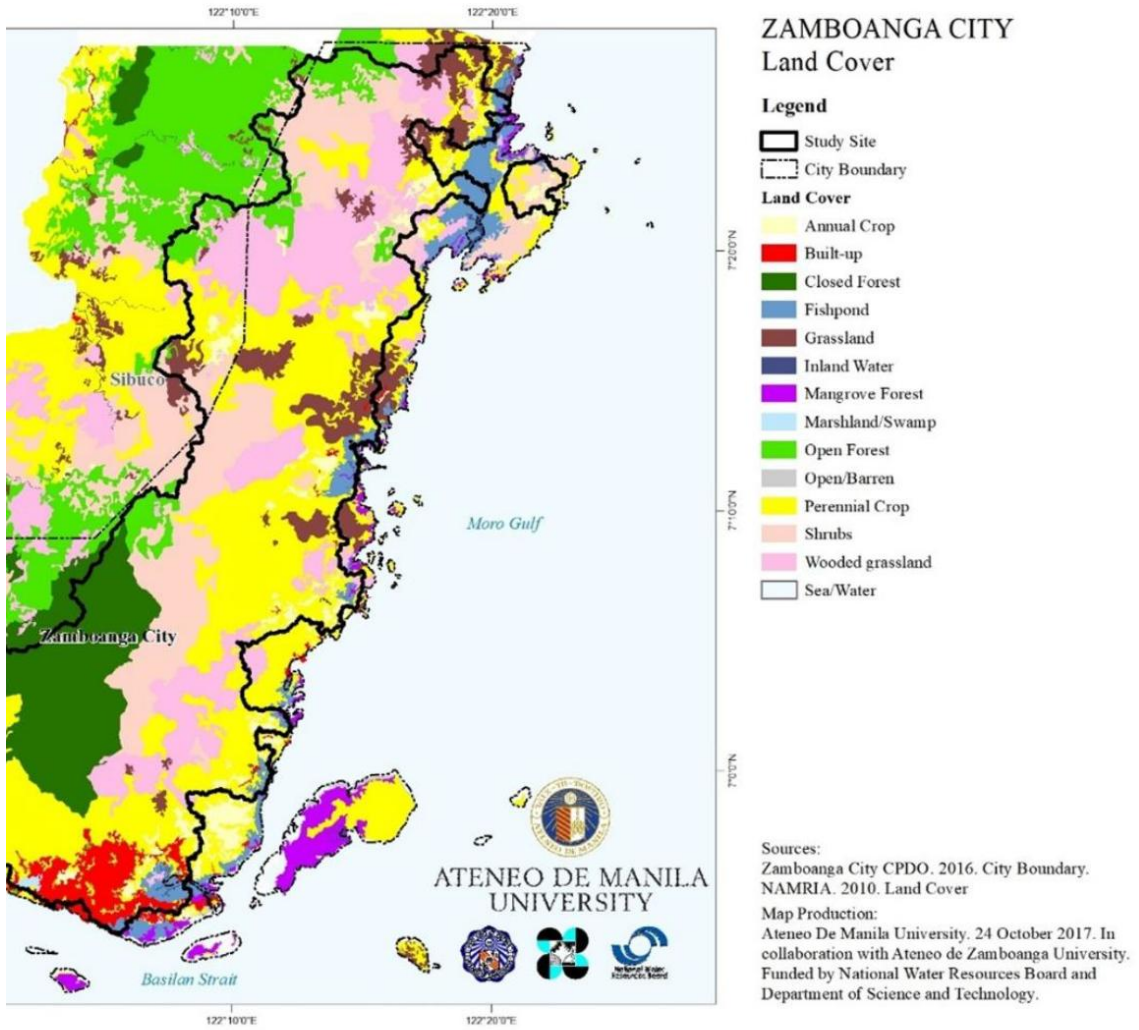
- IFSAR DEM was used to delineate the watershed of Zamboanga
  - Sub-shed was also identified
- Same DEM was used to create a slope map





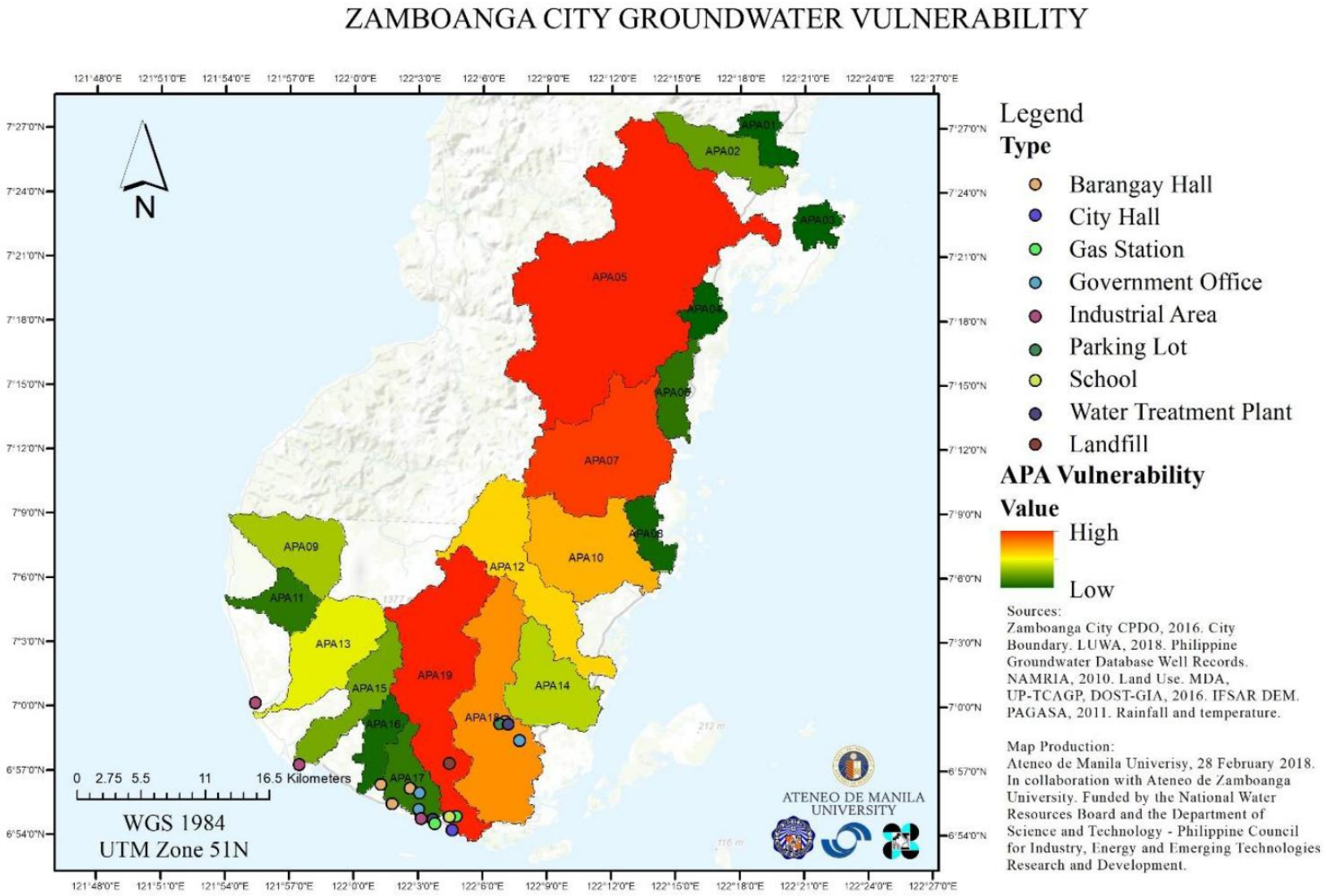
Land Cover Mapping

- Satellite imagery was used to prepare the land cover map
- Urban areas (residential, commercial & institutional areas) were identified
  - Demand for water was centered
- Forest & other vegetation areas were identified
  - Water “source” & “recharge areas”



Vulnerability Analysis

- The vulnerability analysis resulted in the identification of aquifer protected areas (APA)



Results

- APA's 5, 7, and 19 were highly vulnerable
  - APA 18 & 19 – Central Business District
  - APA 5 & 7 – mountainous area/mining
- APA 18 – moderately vulnerable
- APA 17 – fish canning factories

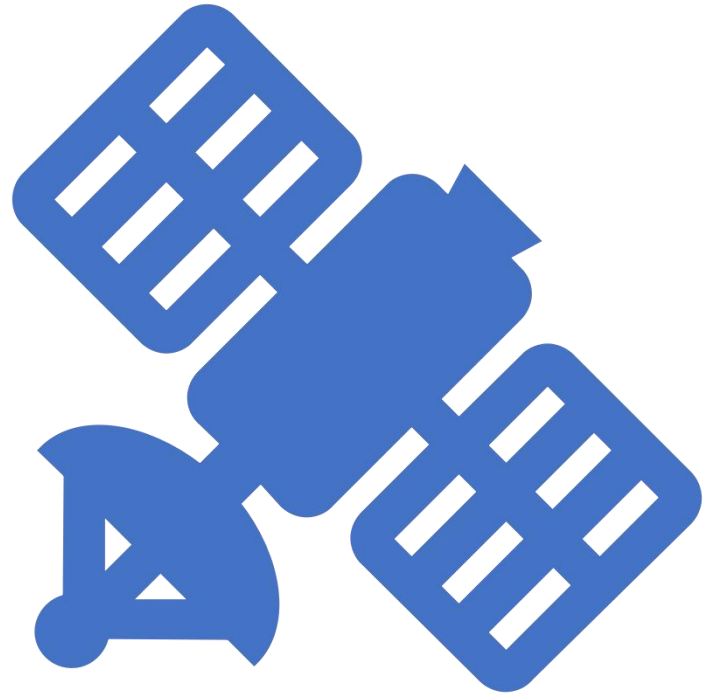
What did we do with the results?

- Using the identified APAs with high vulnerability
  - Modeled water demand versus available water
    - Land use change
    - Population change
  - Monitored water quantity & quality

Reflections

Satellite Data

- Satellite data is very convenient
  - Study large areas
  - Remote Areas
  - Areas with Insurgency Problems
  - Limited time to conduct the research



Limitations

- Sensing Below Ground
- Strata identification
- Cannot be used for quantity & quality issues with groundwater

Lessons Learned

Satellite Data is very useful

integrate with data on the ground


Thank you very much!

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