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 Title of the project Panay River Sub-Basin Environmental Baseline Data Initiative
 Authors C.P. Pornelos, A.M.J. Alvarez, and P.B.C. Arceo

TECHNICAL DOSSIER

Title of the project	Panay River Sub-Basin Environmental Baseline Data Initiative
Authors	C.P. Pomeiros, A.M.J. Alvarez, and P.B.C. Arceo
Title of the course	L Arch 205: Landforms and Other Nature Forms
Academic year	2017 - 2018
Teaching Staff	Nappy L. Navarra, D.Eng.
Department / Section / Program of belonging	Environmental Landscapes Studio Laboratory / Master of Tropical Landscape Architecture Program
University / School	University of the Philippines Diliman / College of Architecture



Written statement, short description of the project in English, no more than 250 words

A comprehensive understanding of an area necessitates a thorough comprehension of the influences exerted by landforms and other natural phenomena on decision-making processes across various conditions and circumstances. To facilitate this understanding, the Panay River Sub-Basin Environmental Baseline Data Initiative strives to generate updated datasets that can be effectively utilized by the local and provincial government for conducting a comprehensive analysis of the Panay River sub-basin. This research endeavor is guided by three primary objectives. Firstly, it seeks to address the existing information gap regarding the physical characteristics of Capiz's scope within the Panay River Sub-basin, thereby contributing to sound planning, policy-making, and decision-making processes. Secondly, the initiative aims to identify and document significant geographical and environmental properties and characteristics of the Panay River and the province as a whole. Lastly, it aims to provide informed recommendations and conduct planning and design analyses based on the most current and up-to-date information available. By achieving these objectives, the initiative endeavors to enhance the knowledge base and resources necessary for effective decision-making and sustainable development in the region.

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SCHOOL PRIZE

Panay River Sub-Basin Environmental Baseline Data Initiative

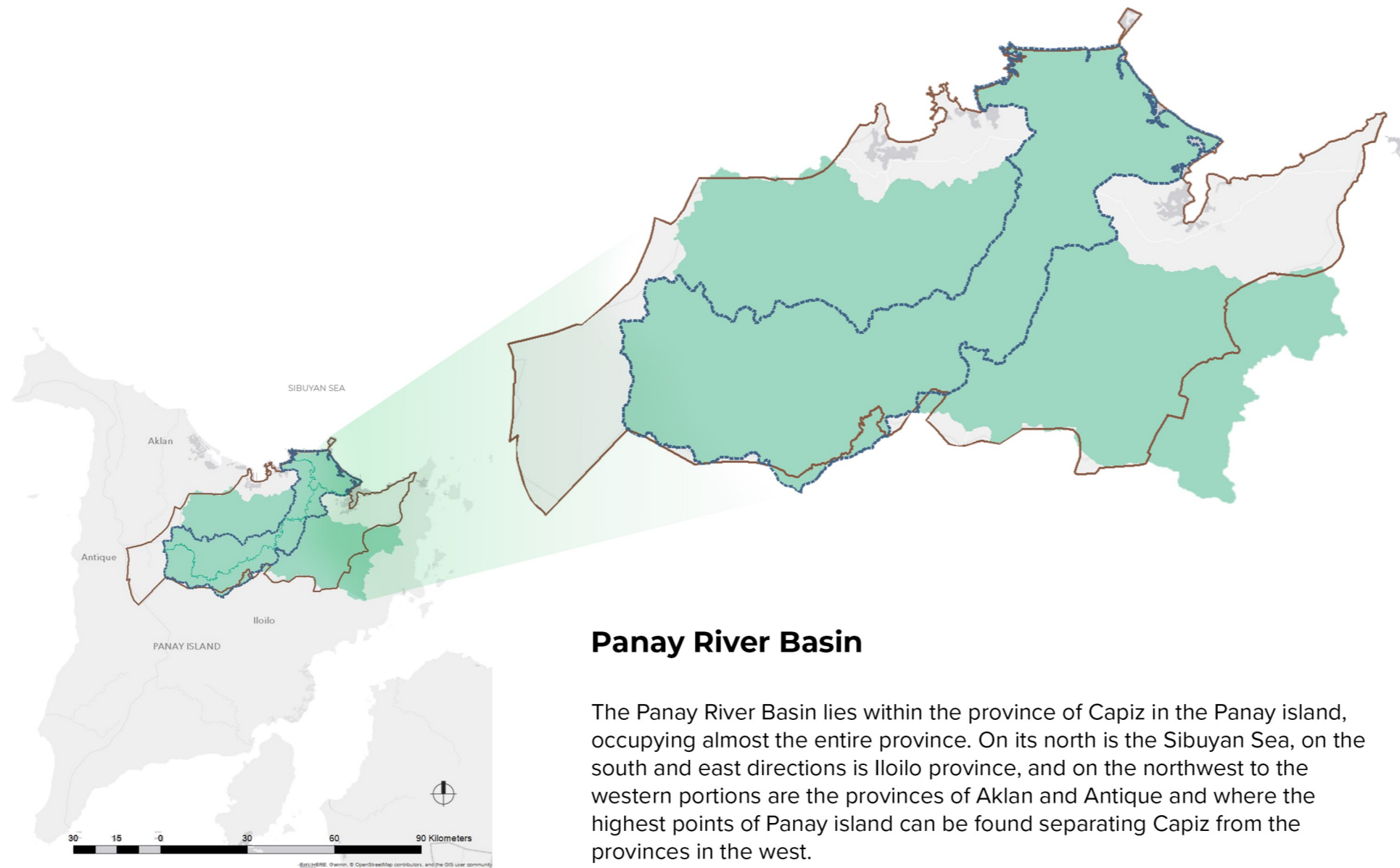
Location

CAPIZ PROVINCE PHILIPPINES

Western Visayas, also known as Region VI, is located in the Central Philippines surrounded by large bodies of water, the Sibuyan sea on the north, the Visayas Sea on the east, and the Sulu Sea on the south. It is composed of six provinces - Aklan, Antique, Capiz, Guimaras, Iloilo and Negros Occidental. Panay island is where the province of Capiz, Aklan, Antique and Iloilo are situated. The region is about 4.26 percent of the total land area of the Philippines.

Legend

- Panay River
- Panay Sub-basin
- Panay River Basin
- Capiz



Panay River Basin

The Panay River Basin lies within the province of Capiz in the Panay island, occupying almost the entire province. On its north is the Sibuyan Sea, on the south and east directions is Iloilo province, and on the northwest to the western portions are the provinces of Aklan and Antique and where the highest points of Panay island can be found separating Capiz from the provinces in the west.

Its total area is approximately 2,203 square kilometers based on the boundaries used by the Department of Environment and Natural Resources (DENR). The basin is further divided into four sub-basins - Badbaran, Maayon, Mambusao and Panay sub-basins. The main drainage channel of the basin is the Panay River, flowing from west to east going to Sibuyan Sea. It stretches at an approximate length of 190 kilometers, and is considered as the longest river in Panay island (DENR, 2014).

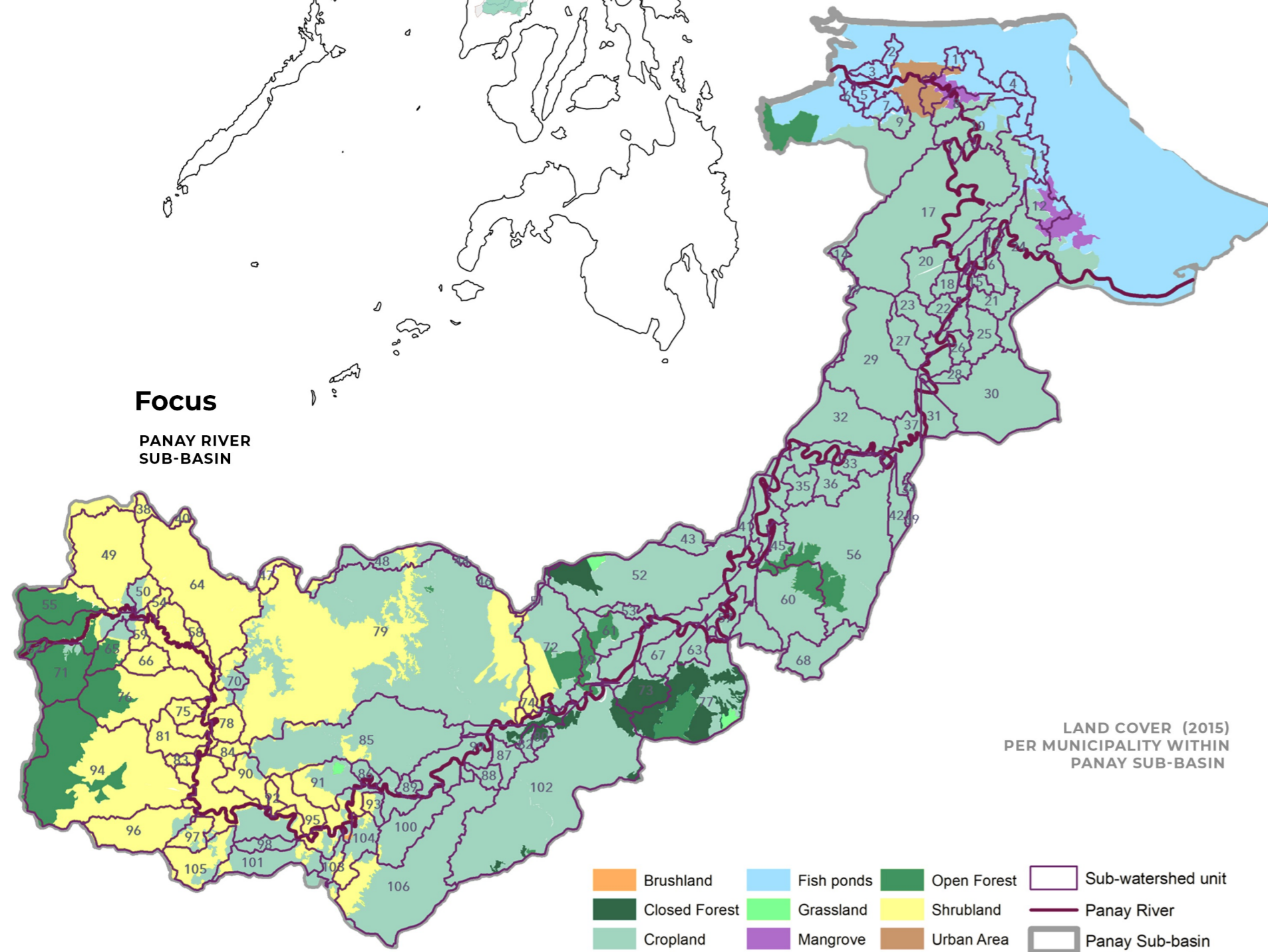
VULNERABILITY CRITERIA AND THE CORRESPONDING PARAMETERS



Soil	Slope (%)	Land Cover	Groundwater Availability	Population Density (per Km ²)	Building Footprint (%)
loam, hydrosol	0-5	Closed forest, mangrove	Fairly extensive and productive aquifers	≤ 200	0-0.5
undifferentiated	6-8	open forest, shrubland	local and less productive aquifers	≤ 500	0.6-1.0
sandy clay loam	8-12	grassland, brushland	Rocks with limited potential	≤ 1500	1.1-5.0
clay loam, sandy loam	12-13	fishpond, cropland	Rocks without any known significant groundwater obtainable through drilled wells	≤ 5000	5.1-50.0
clay, sandy	>18	urban area		≤ 19000	51-100

Focus

PANAY RIVER SUB-BASIN



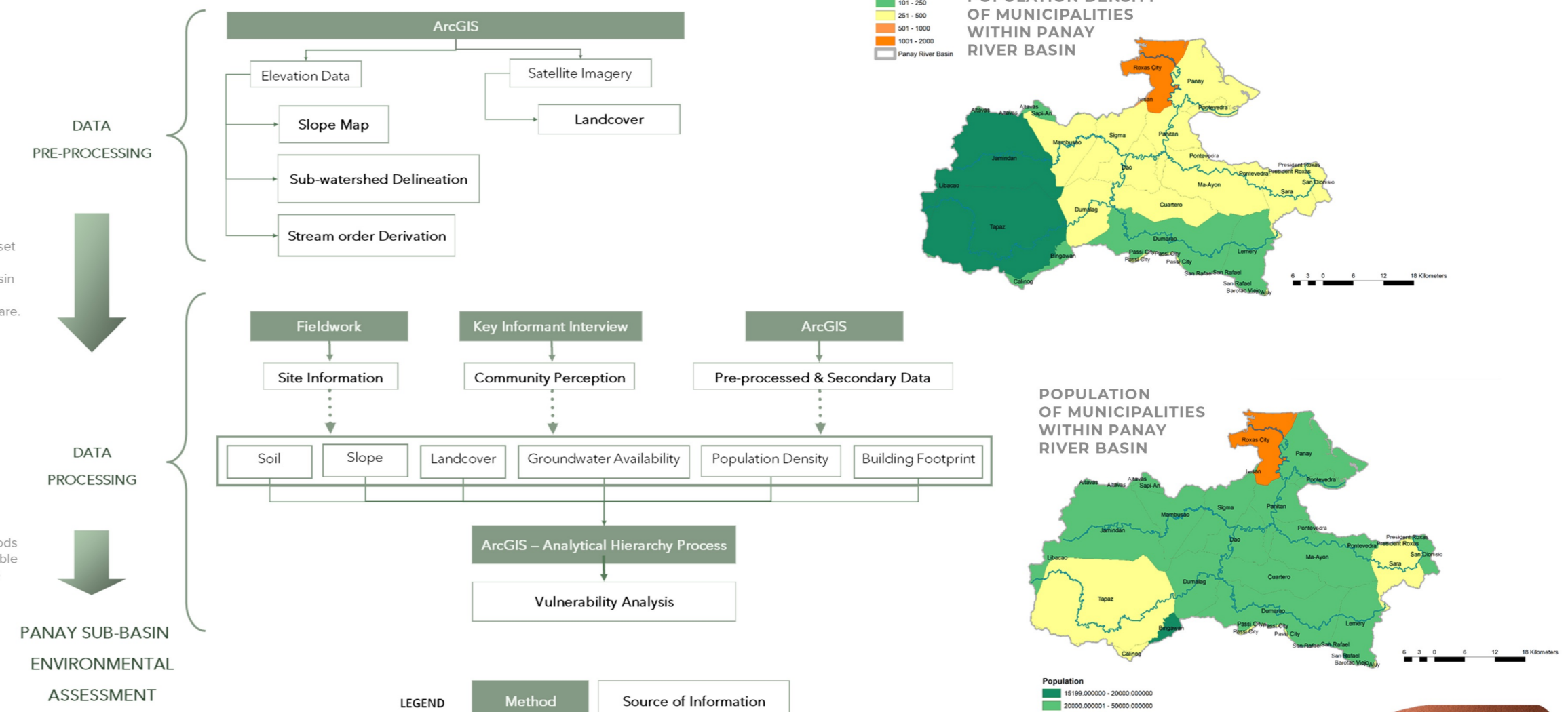
DATA FLOW PROCESS FRAMEWORK

STEP 1

The Data were either collected or accessed to produce another dataset and accomplish the environmental vulnerability analysis of the sub-basin to degradation. These data were processed using ArcGIS 10.4 software.

STEP 2

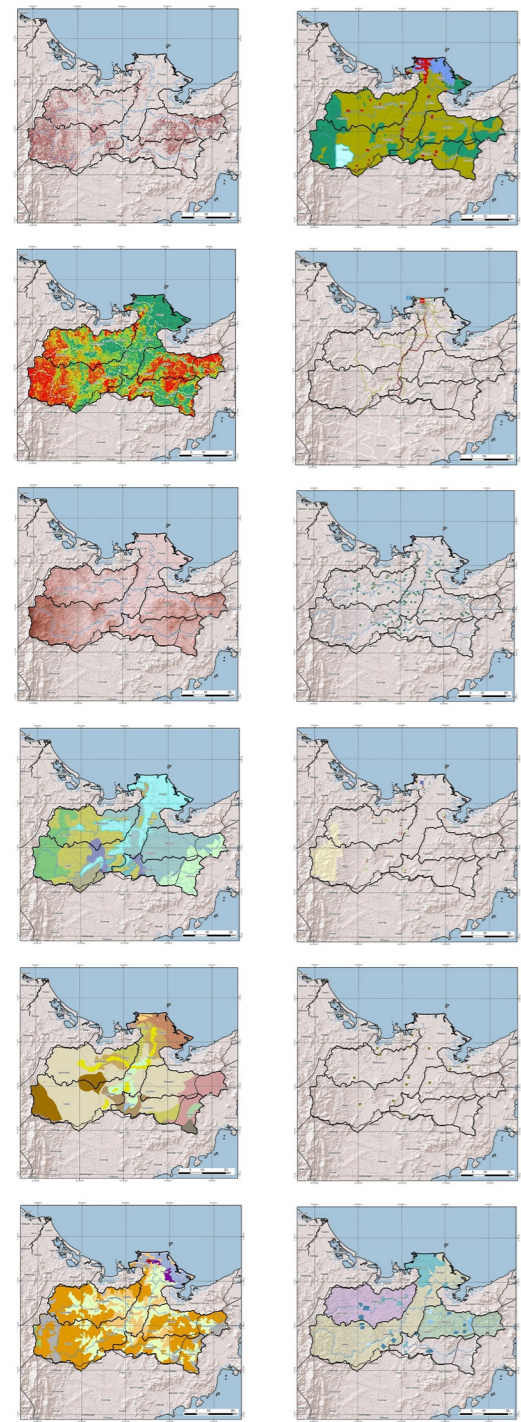
This stage encompasses the methods employed to process readily available information needed to produce the target output.



LEGEND Method Source of Information

Panay River Basin

Base Maps



Despite being the seafood capital of the country, 67 percent of Capiz basin is used for agricultural purposes compared to 4 percent which is used for fishponds. Forest land occupies 25% of the basin, but only 2% is allotted for the Forest Reserve, same as the amount built-up of areas. (DENR, 2014).

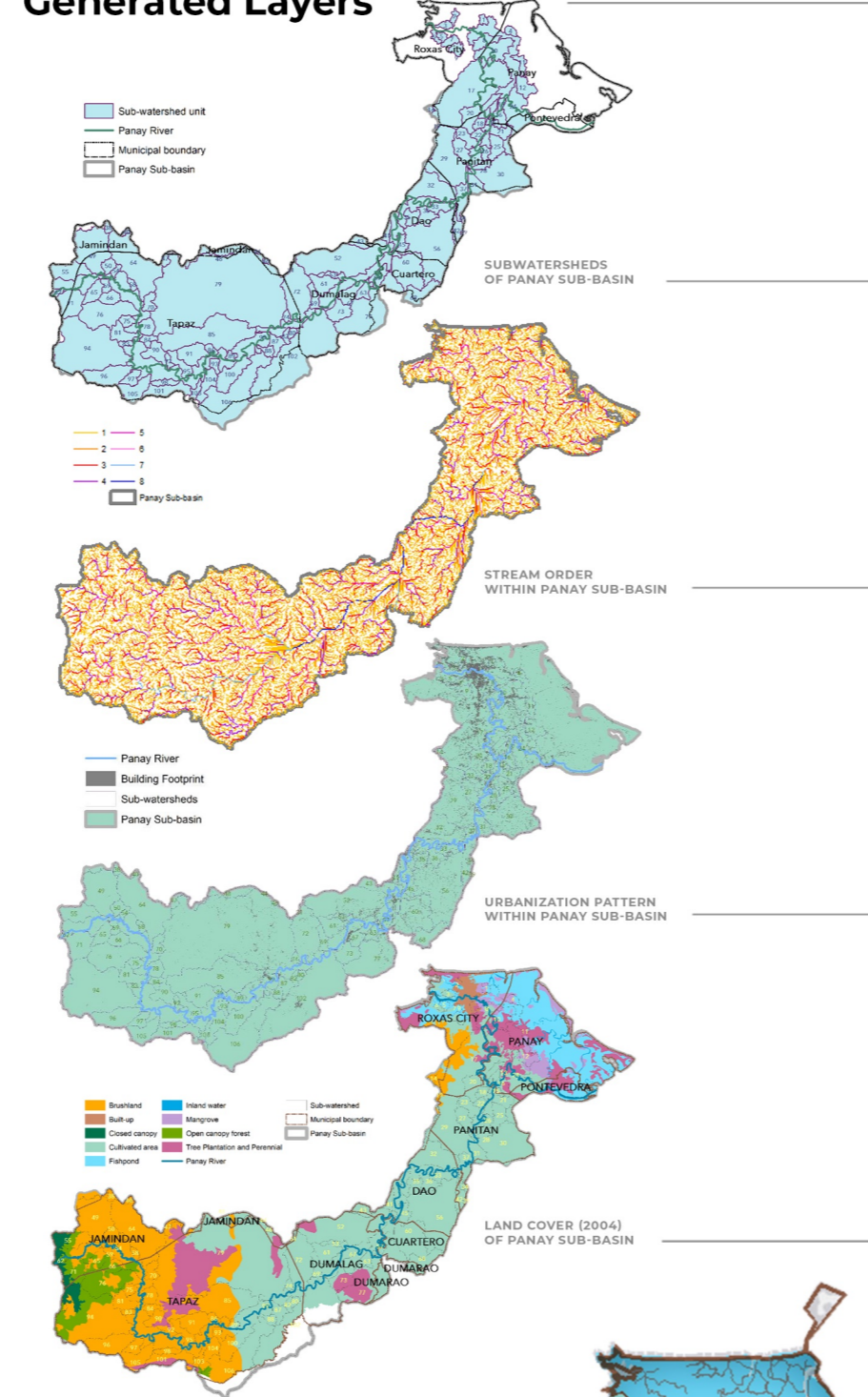
These maps were consolidated from the Panay River Basin Integrated Management and Development Master Plan which served as basis for the generated maps and the updating of other baseline information.

SOURCE: National Mapping and Resource Information Authority (NAMRIA)

NOTE: Coordinate System: GCS PRS 1992



Generated Layers



ECOLOGICAL STRUCTURE

There are 106 sub-watersheds derived within the Panay sub-basin which cover an estimated total area of 86,262 hectares. The largest unit is sub-watershed no. 79 which lies between Tapaz and Jamindan with 113,248,695.67 square-meter coverage. The smallest unit is no 19, located at the borders of Panitan and Sigma, it has an area of 221,521.60 square meters, even larger than some of the barangays. These units provide a new delineation for more detailed assessments and program implementations.

URBANIZATION

Building footprints are expectedly concentrated in the capital city of Roxas and its nearby areas. The structures can be observed to increase in proximity to the river.

Landcover	Total Area (sq. m)	%
Grassland	1,457,739	0.14
Cropland	58,339,896	64.40
Shrubland	221,329,489	21.40
Open Forest	45,733,361	4.47
Closed Forest	18,759,693	1.76
Waterbody	129,117	0.01
Urban Area	14,626,101	0.14
Fish ponds	148,342,102	13.43
Urban Area	6,126,109	0.01
Total Area	1,044,962,000	100

LAND COVER

The largest portion of the sub-basin is covered with croplands, however, these agricultural areas are also mixed with patches of grasslands, brush lands and shrub lands. In the areas upstream, shrub lands are more extensive than open and closed forests. Open forests are only found near the borders of Capiz and Antique, in the rugged terrains and steep slopes.

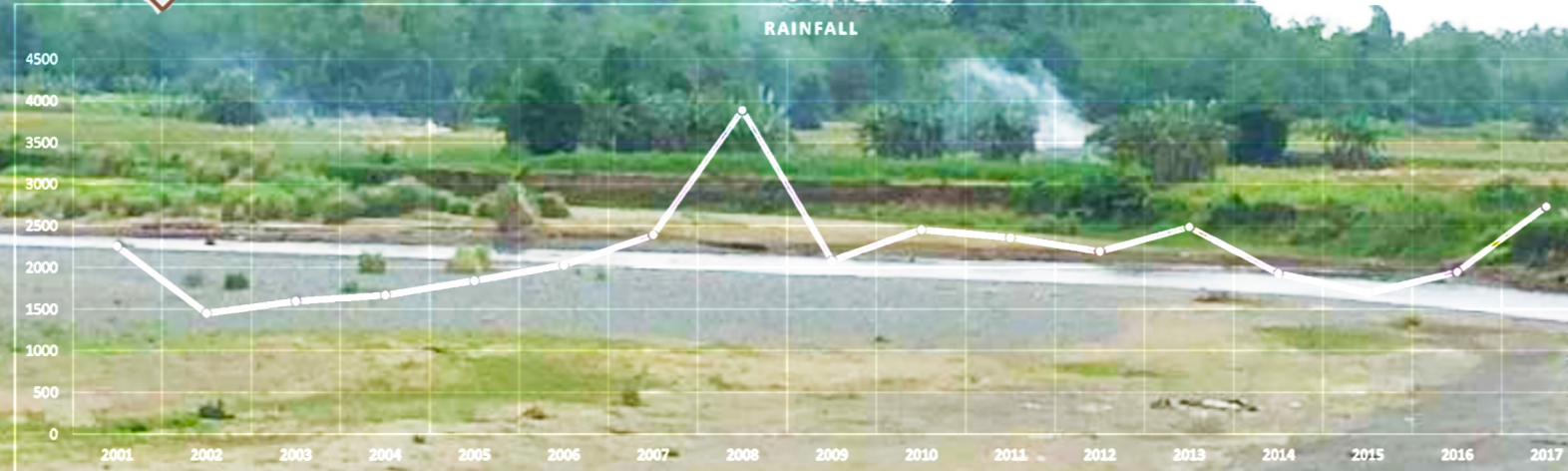
Major and Minor Water Channels

BOUNDARIES

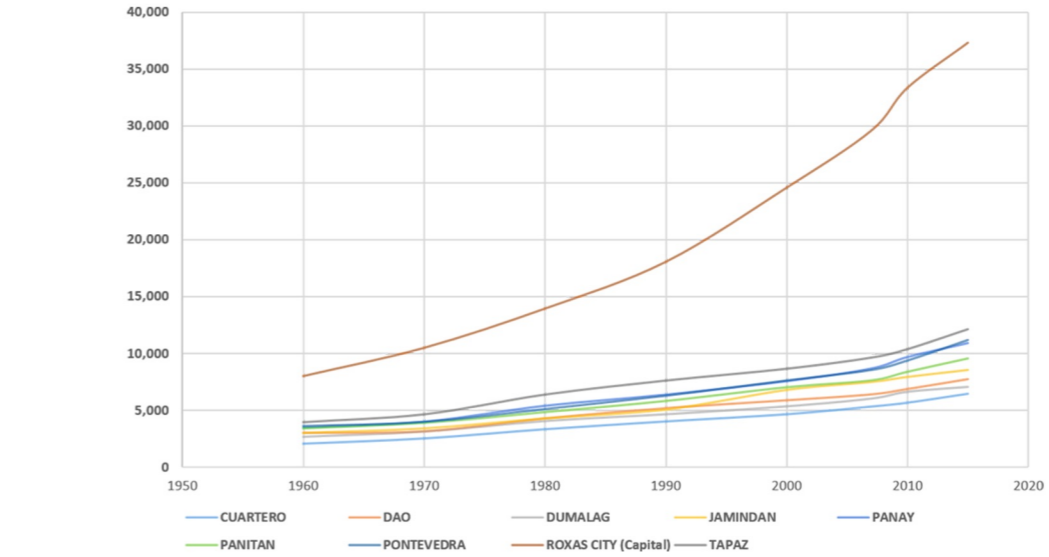
- Capiz Boundary
- Panay River Basin
- Panay River Coverage

STREAMS

- Badbaran River
- Maayon River
- Mambusao River
- Panay River
- Minor Streams



LINE GRAPH RAINFALL TIME SERIES

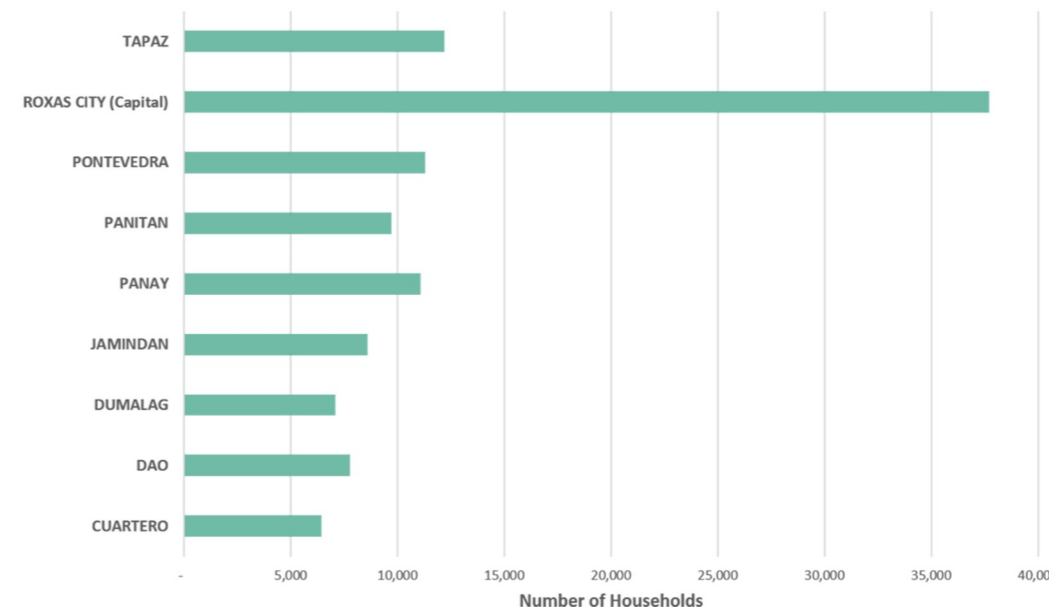


OCCUPIED HOUSING UNITS

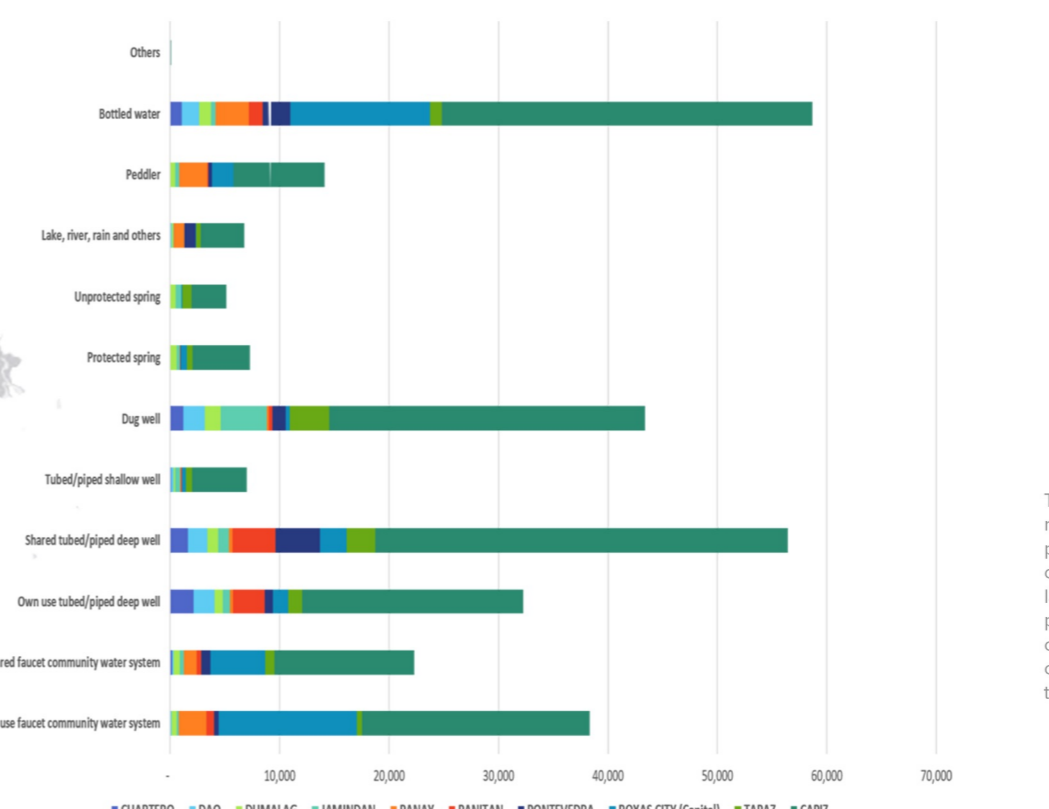
Social Context

Roxas City has the highest population and population density of the municipalities within the basin. In 2015, it has a population of 167,003 and a population density of 1757 persons per square kilometers. In Capiz, Sapi-an has the least number of population with 25, 821 and Jamindan having the lowest population density of 89 persons per square kilometer, followed by Tapaz with 99.

Roxas City showed a surge on the increase of housing units from 1960-2017 compared to the other municipalities along the Panay River. In 2015, Roxas City has thrice the number of its households compared to the average number among the other municipalities.



HOUSEHOLD STATISTICS



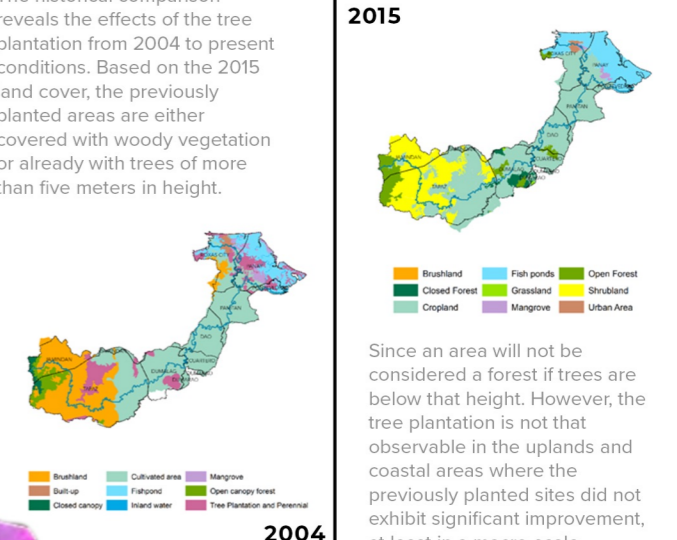
SOURCE OF WATER SUPPLY FOR DRINKING

Population tends to increase as it gets nearer to the coastal portion of the sub-basin. One reason is due to their seafood industry since the province of Capiz is known as the seafood capital of the Philippines.

Municipalities included in the graph are those where the Panay River passes through. Data revealed that there are 3,998 out of the 179,983 households in Capiz depending on rivers and lakes for drinking water.

HISTORICAL CHANGES

The historical comparison reveals the effects of the tree plantation from 2004 to present conditions. Based on the 2015 land cover, the previously planted areas are either covered with woody vegetation or already with trees of more than five meters in height.



Since an area will not be considered a forest if trees are below that height. However, the tree plantation is not that observable in the uplands and coastal areas where the previously planted sites did not exhibit significant improvement, at least in a macro-scale.



FLORA

Common name: Malatungaw
Botanical name: *Melastoma malabathricum*

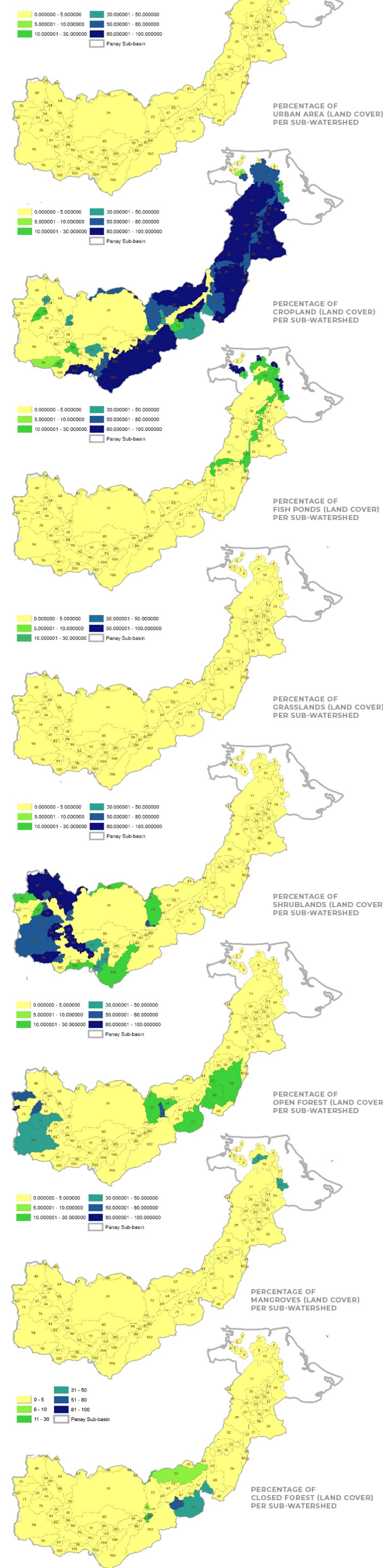
Description:

- + Indigenous species
- + Tolerant of dry and nutrient poor conditions
- + Prevalent in the grasslands of Jamindan, Capiz



Panay River Sub-basin

LAND COVER DISTRIBUTION



Assessment

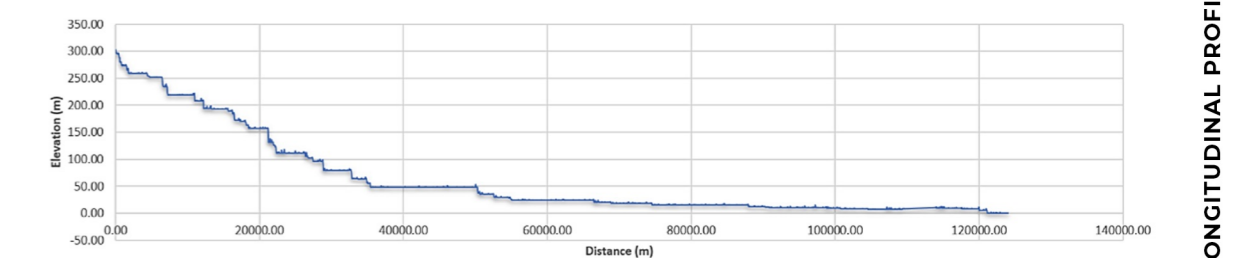
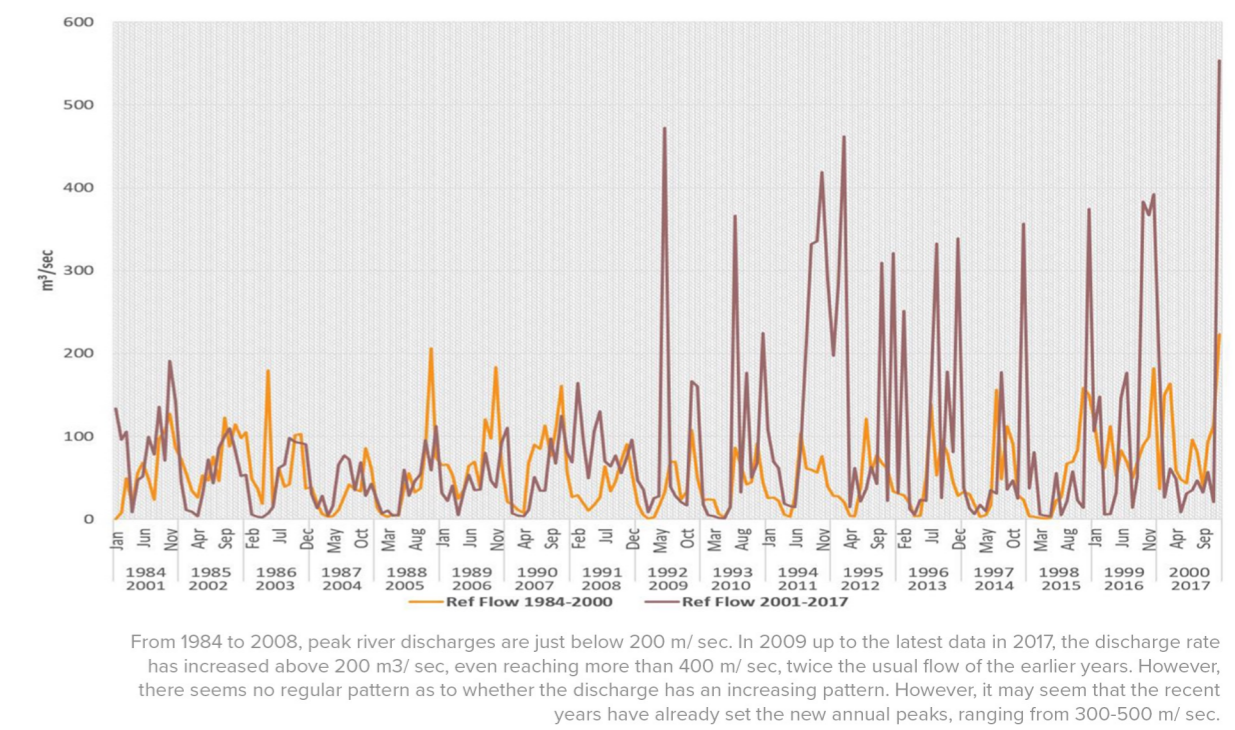


In this report, the assessment was further focused on the sub-watershed units within the Panay sub-basin. Certain conditions within the sub-watershed units were further observed such as the type of land cover, population density, and urbanization using building footprints. These were analyzed along with selected geographic factors such as soil type, slope, and the area's availability of groundwater aquifers. The results of the final analysis reveals that almost half of the total area of the sub-basin has moderate environmental vulnerability to degradation. The parameters used in the analyses were comprised of both human and natural condition factors which suggests that anthropogenic activities, being the ones which we may have more control over, are not being effectively managed to reduce unwanted impacts to the ecosystem and are increasing the risk of the environment to worsening of its conditions.

Land cover is the most prominent contributing factor of the selected criteria. The current land cover types dominating the landscape is highly influenced by human activities upstream and downstream. The land has been exploited for long periods, thus changes on the behavior of natural calamities and the capacity of the environment to recover has already malfunctioned as evidenced by the sentiments of the community people who were interviewed for this research.



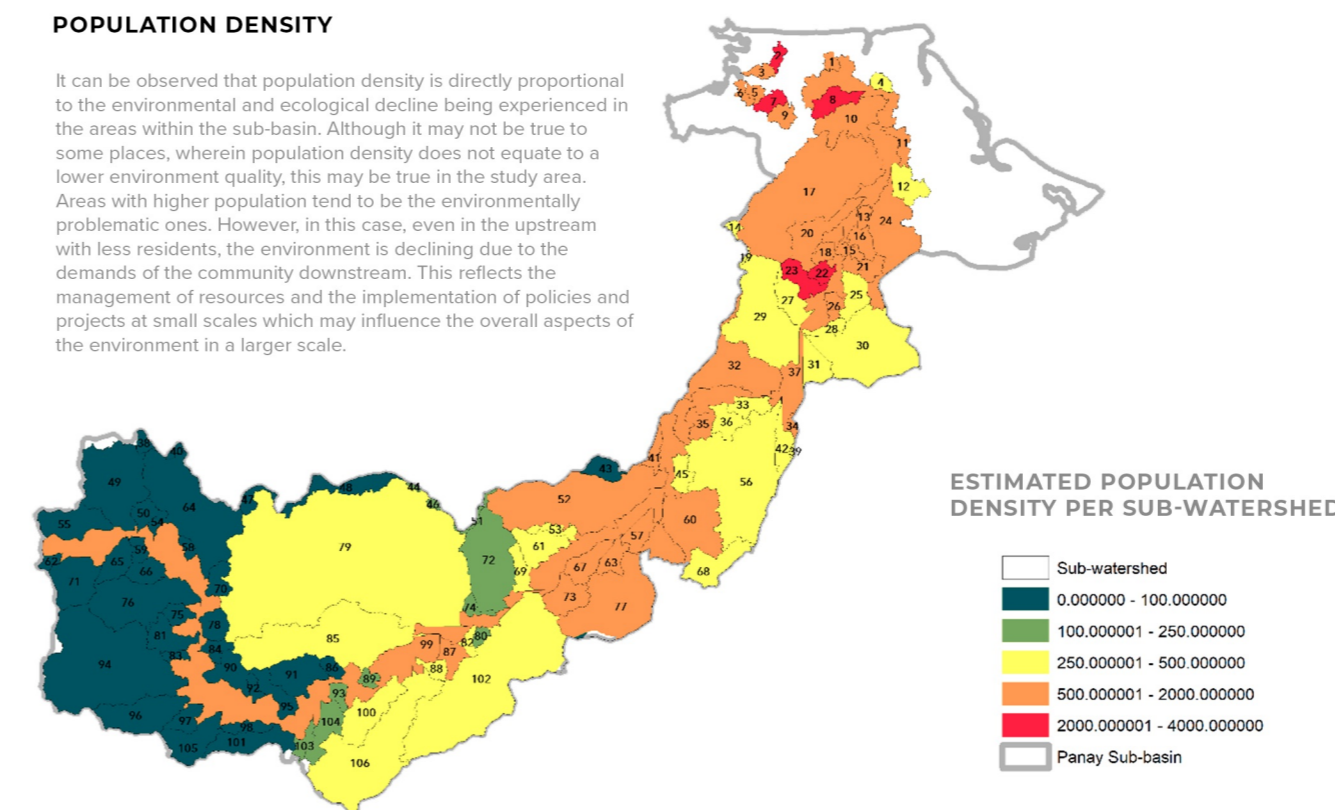
PANAY RIVER DISCHARGE



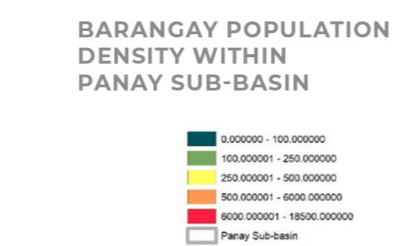
The profile shows the difference in elevation of the areas traversed by the Panay River. It revealed how the elevation made the province of Capiz a catch basin of the runoffs from the mountainous portions of Tapaz and Jamindan.

POPULATION DENSITY

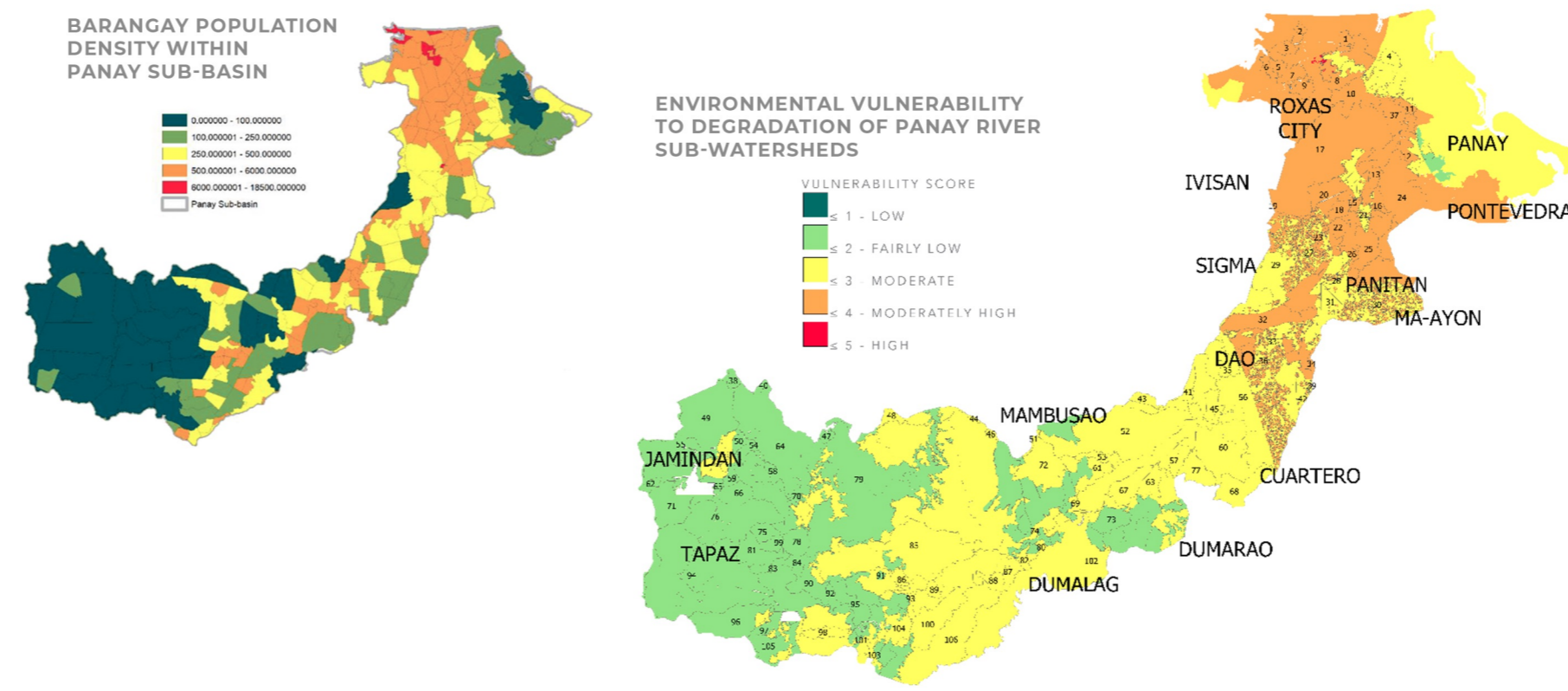
It can be observed that population density is directly proportional to the environmental and ecological decline being experienced in the areas within the sub-basin. Although it may not be true to some places, wherein population density does not equate to a lower environment quality, this may be true in the study area. Areas with higher population tend to be the environmentally problematic ones. However, in this case, even in the upstream with less residents, the environment is declining due to the demands of the community downstream. This reflects the management of resources and the implementation of policies and projects at small scales which may influence the overall aspects of the environment in a larger scale.



BARANGAY POPULATION DENSITY WITHIN PANAY SUB-BASIN



ENVIRONMENTAL VULNERABILITY TO DEGRADATION OF PANAY RIVER SUB-WATERSHEDS



Micro-scale Perspective

Sub-watershed assessment provides a more micro-scale perspective of the situations influencing the environmental conditions occurring in the sub-basin. Since these sub-watersheds are where the water flows towards the tributaries, zooming-in to this level may reveal certain details to be considered for water quality protection and management, development proposals and land-use planning. Furthermore, the research conducted may be made more comprehensive and useful in micro-scale planning when information, especially about the river flow and its riverine landscape, could be investigated in different environmental aspects inherent to its behavior and evolution.

