

QUESTION

**What public transport
do you wish your
province had?**

MUNTA

Pampanga Metro
Transit System





WHAT DO WE WANT TO SOLVE?

Business Case

Given the focus of transit systems in Metro Manila:

How can the team lay the groundwork for a transit systems in highly urban provinces in the Philippines?

WHAT DO WE PLAN ON DOING?

Where to place train stations within the province?





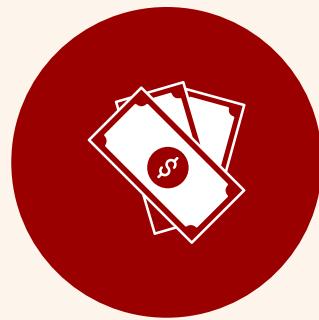
Connect

Connect all cities
both urbanized and
rural



Decongest

Ease the traffic
experienced by an
urbanized province



Enhance

Encourage
economic growth
within the area

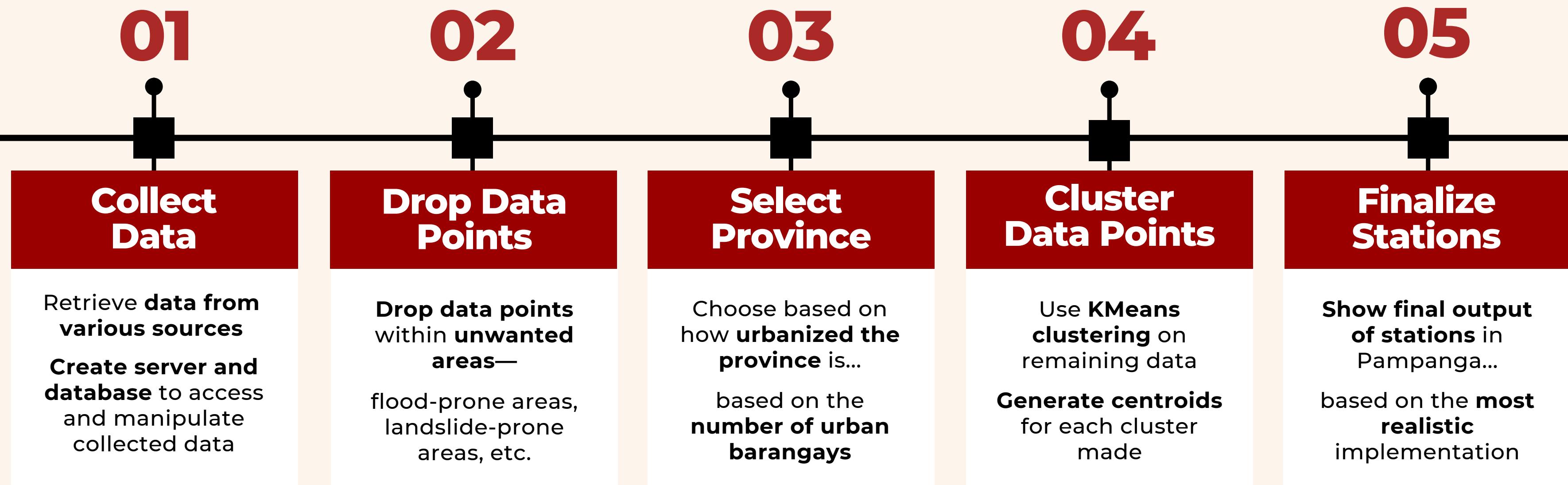


MOTIVATION

QUESTION

**How will the team
actualize this project?**

METHODOLOGY



STEP ONE

Collect data from various sources

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Collect data from various sources



OSM

Nodes: buildings
and amenities



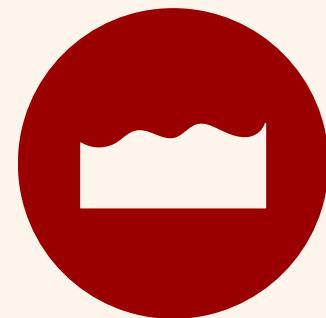
GEOPORTAL

Land cover and
slope map



GADM

Administrative
areas or borders



NOAH

Flood, and
landslide risk



01

Download all datasets
from different sources

02

Create server and dbs
using PostgreSQL

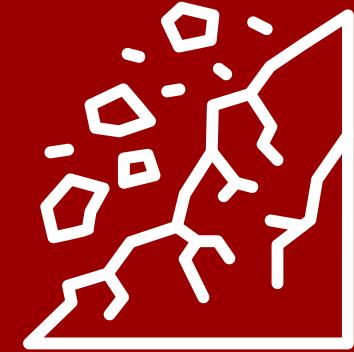
03

Connect Jupyter Lab to
server

STEP TWO

Drop data points at unwanted locations

UNWANTED AREAS TO PLACE A TRAIN STATION



LANDSLIDE

Landslide-prone areas with medium and high hazard risks



TERRAIN

Greater than 8% slope; acceptable is 0% to 8% slope



FLOOD

Flood-prone areas based on 100-year flood areas

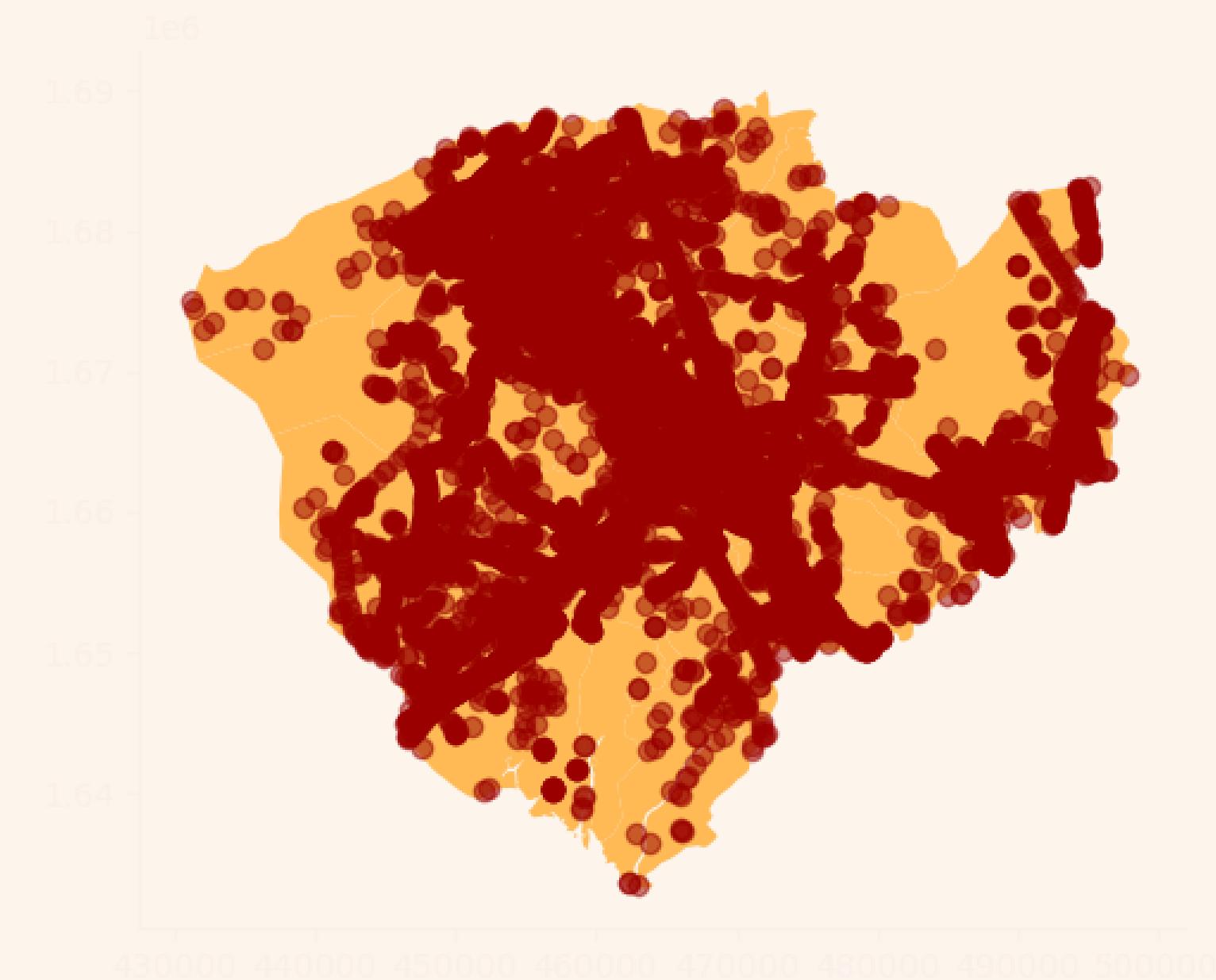


LAND COVER

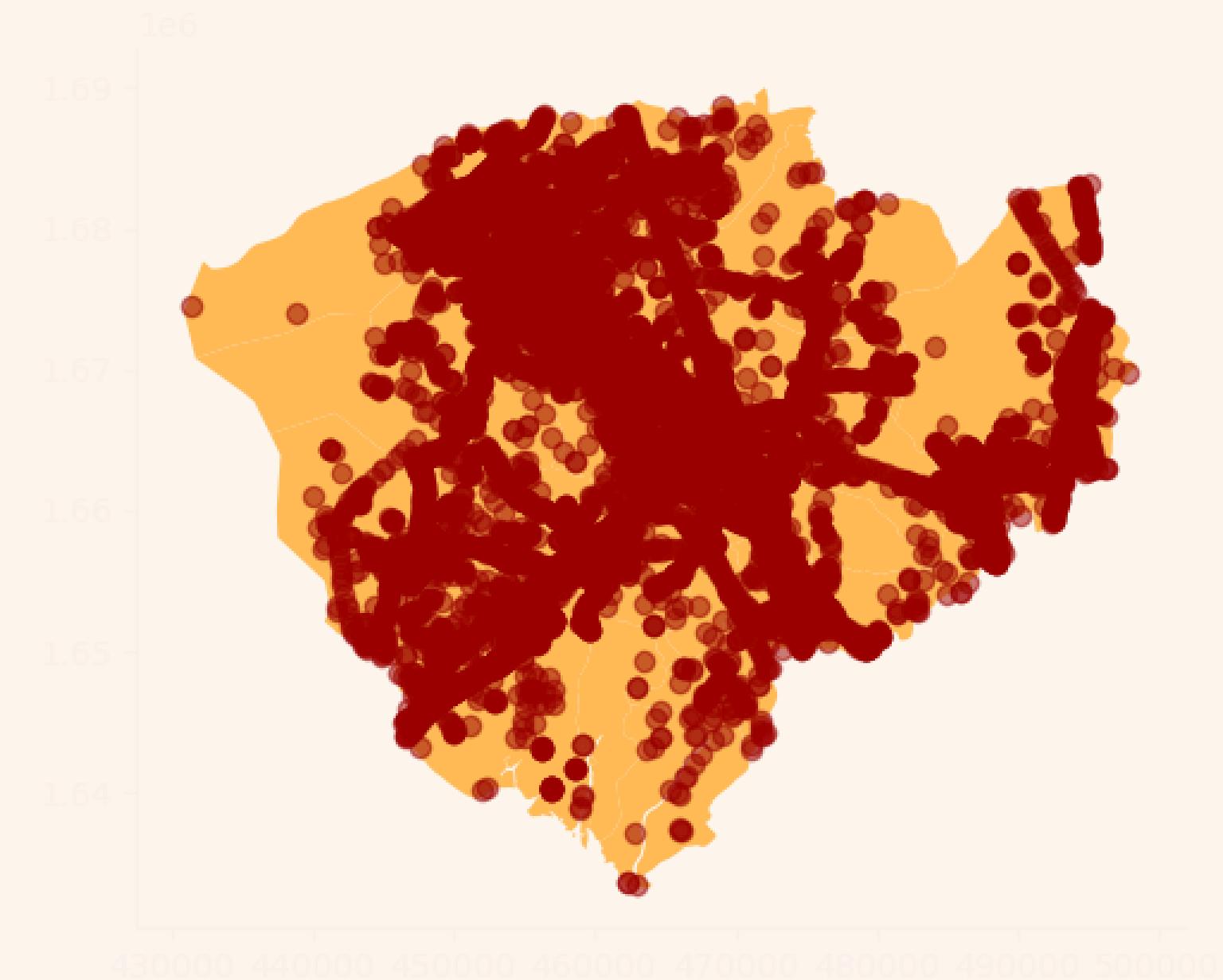
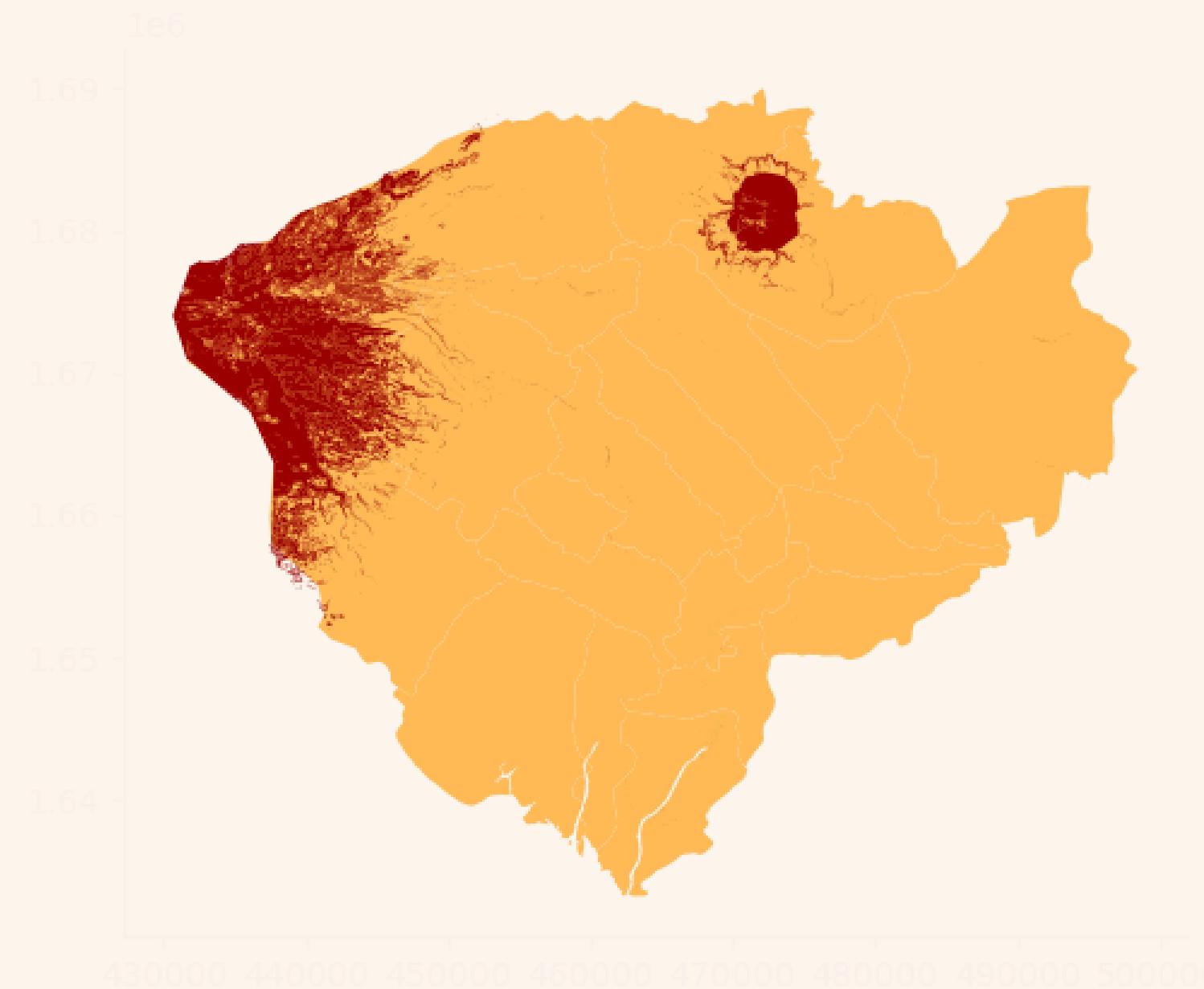
Do not include inland water, marshes, and fishponds

Data points (amenities, building, and residential structures) within these areas will be removed to prevent them from being considered during clustering

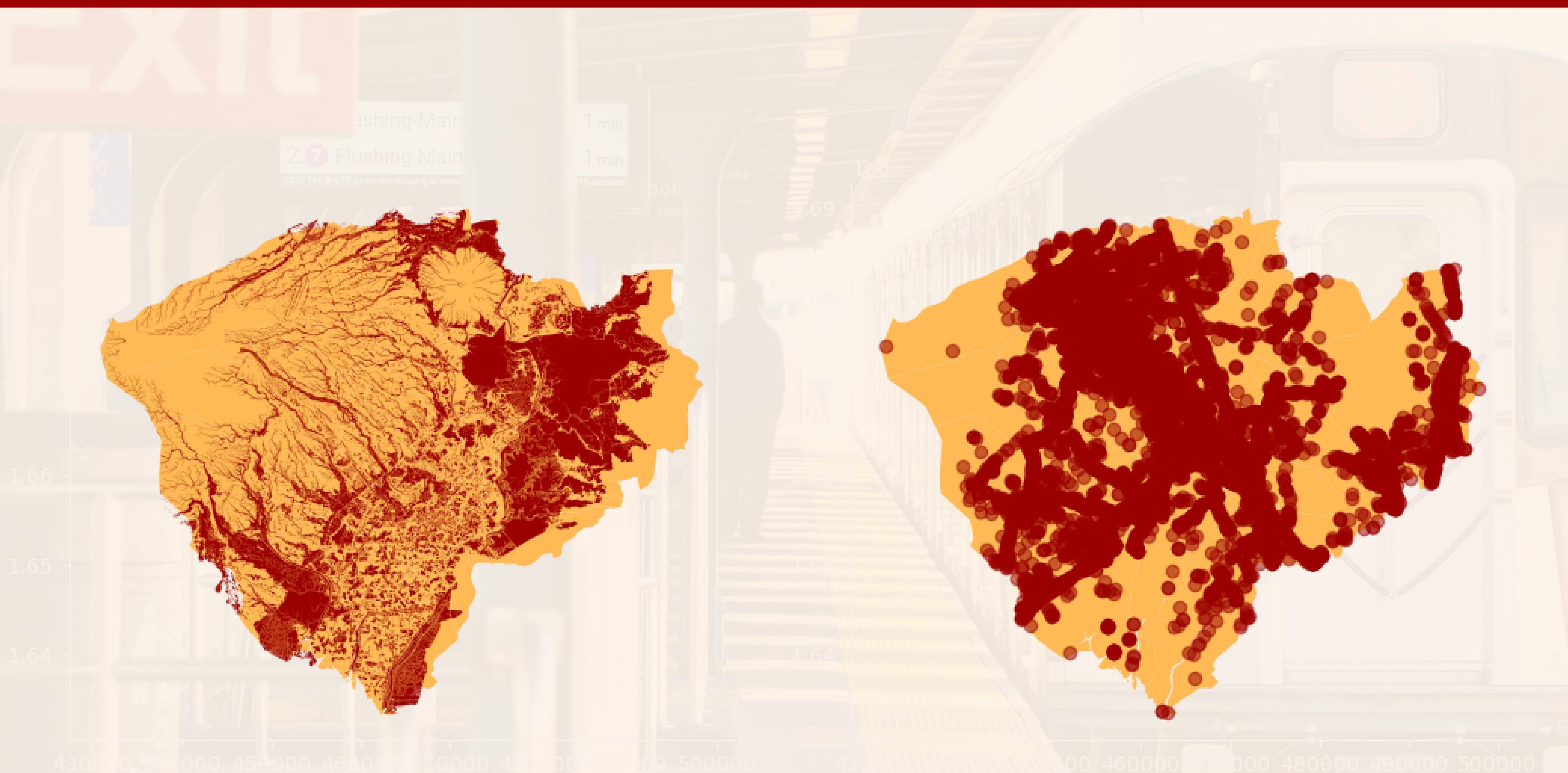
PROVINCE OF PAMPANGA



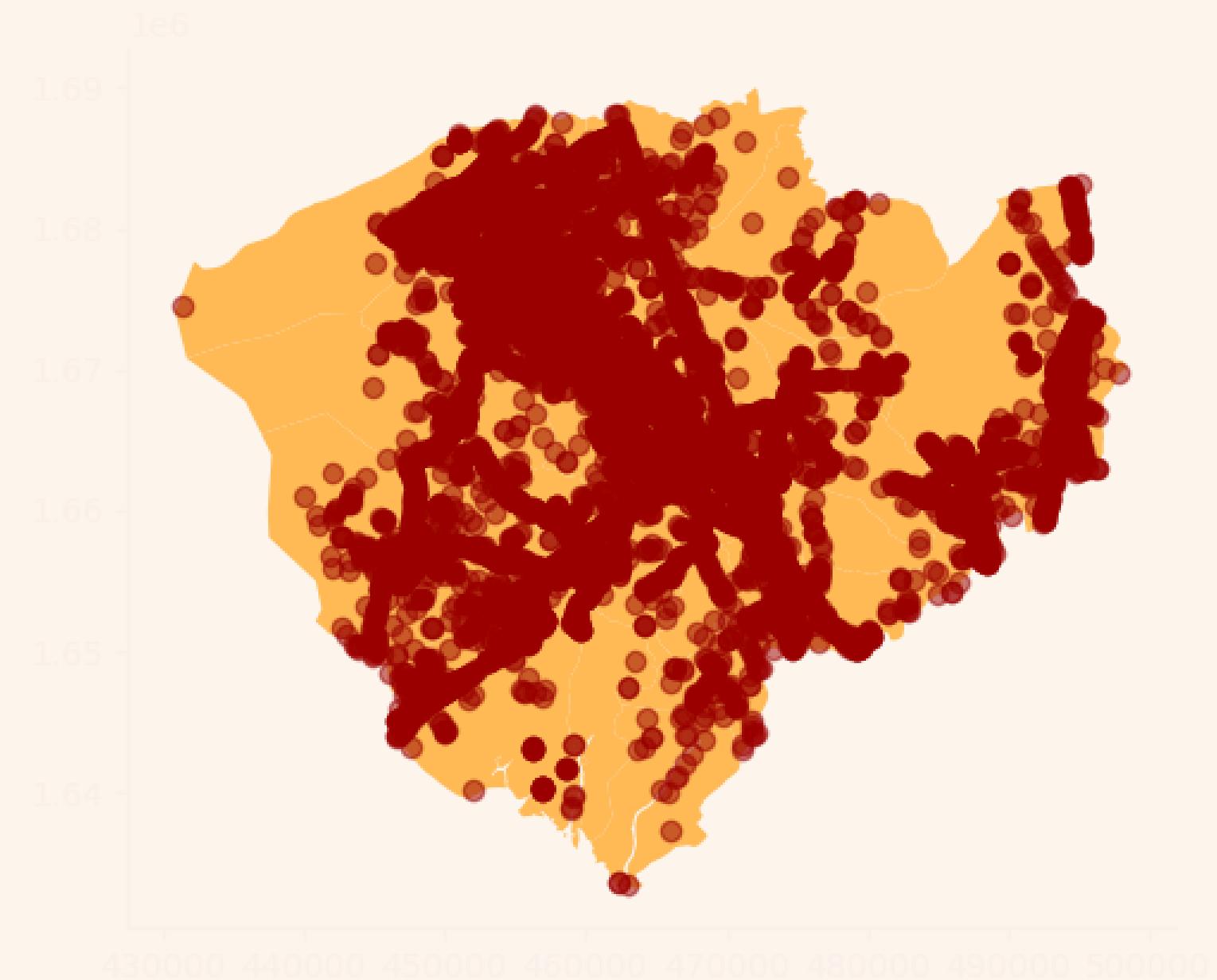
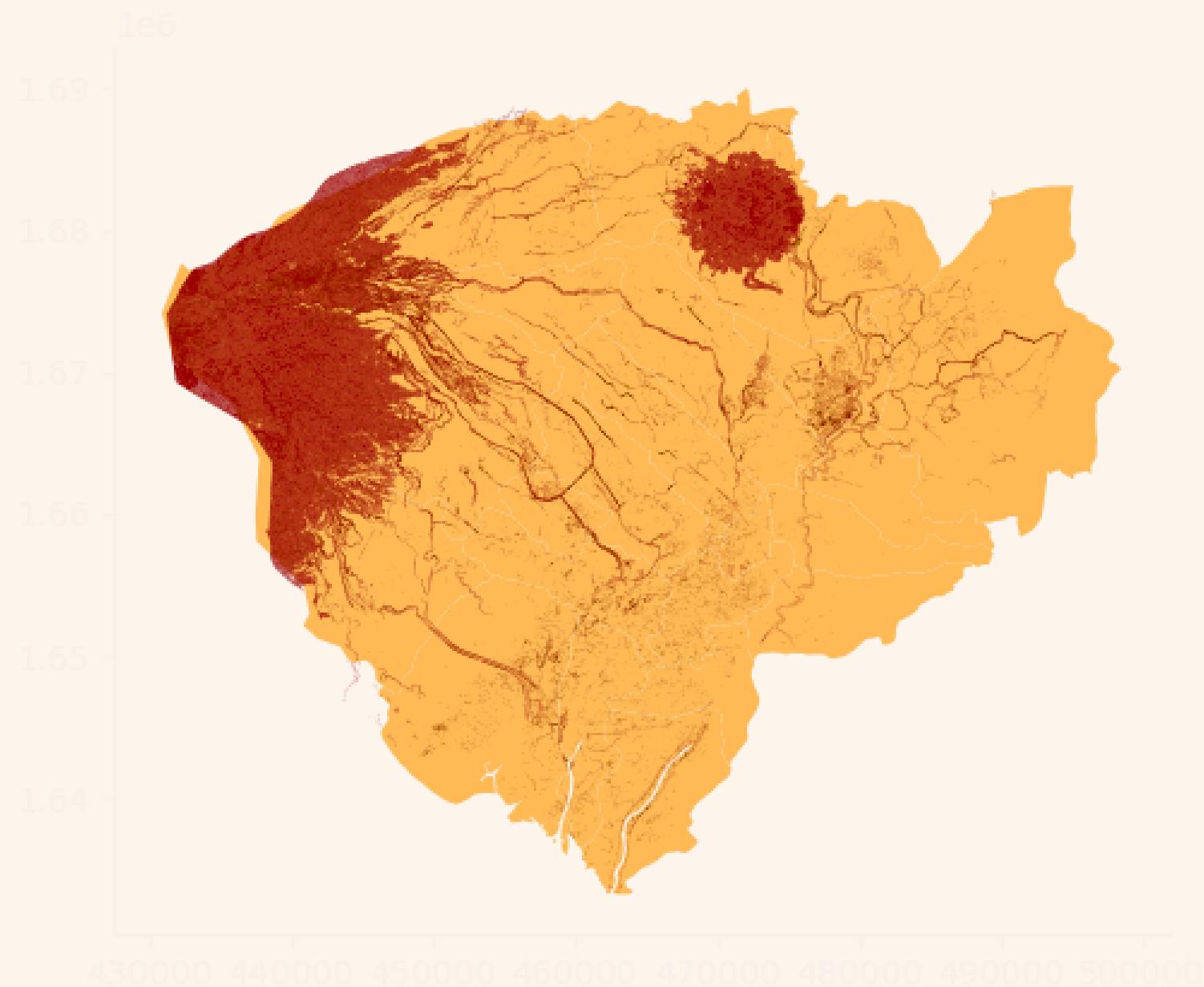
LANDSLIDE-PRONE AREAS



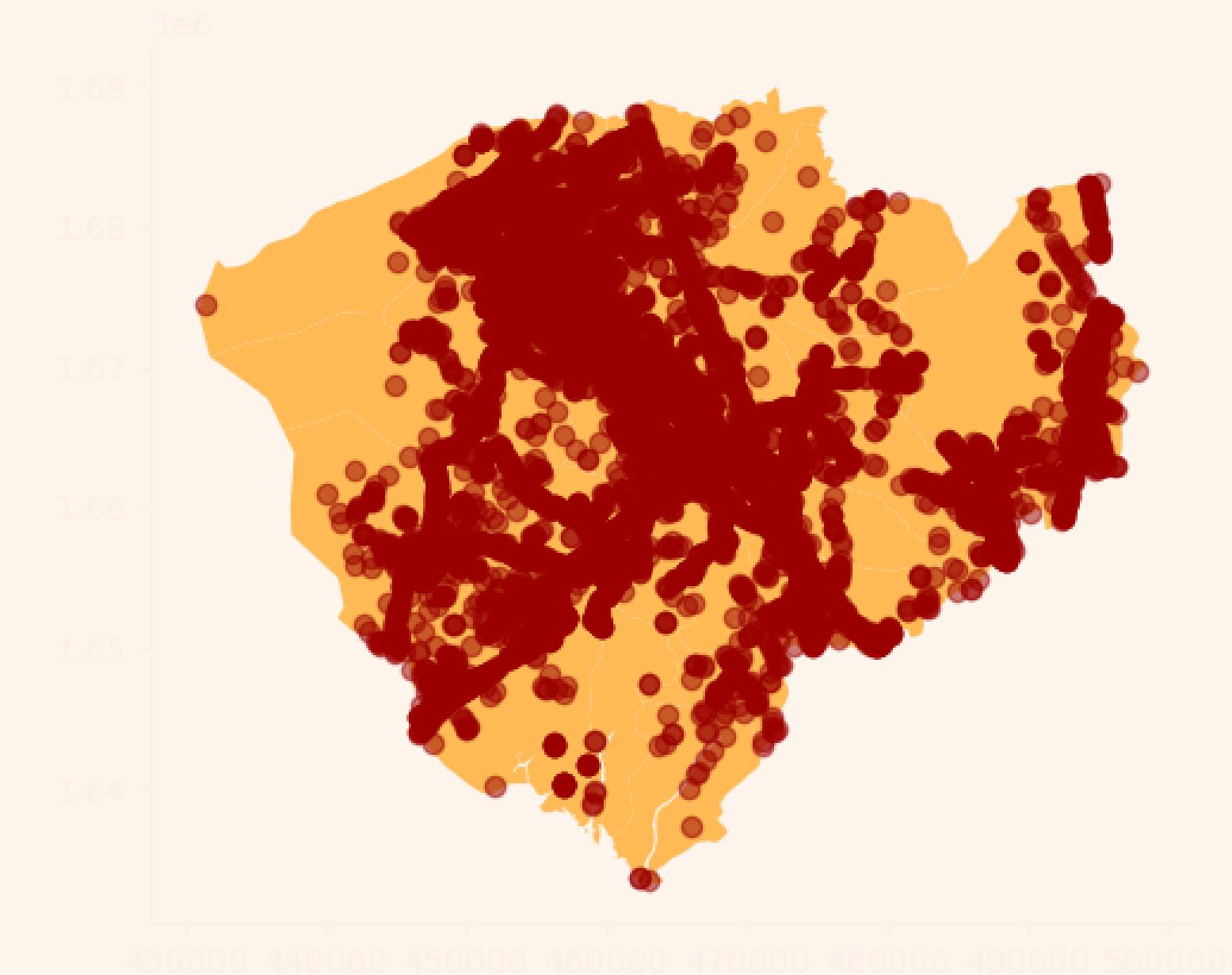
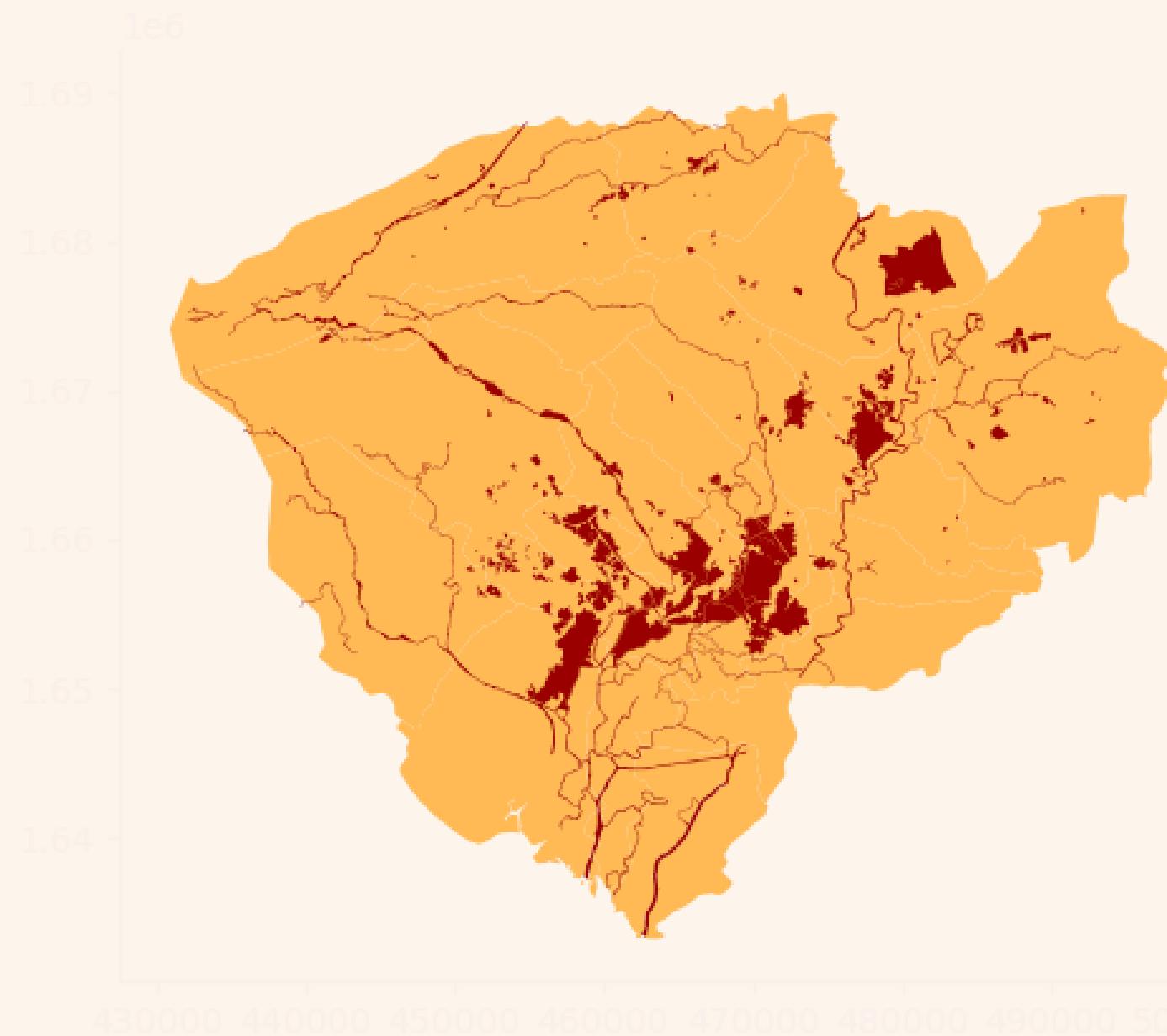
FLOOD-PRONE AREAS



TERRANEOUS AREAS



LAND COVER



STEP THREE

Select an Urbanized Province
to put a transit system in

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Select an Urbanized Province to put a transit system in

Proportion of the number of urbanized barangays within a province will be the basis of our candidate provinces for a transit system

BASIS OF AN URBANIZED BARANGAY



POPULATION

At least 5,000 population size



ESTABLISHMENTS

Presence of establishments with 100 employees



ESTABLISHMENTS

>=5 establishments with 10-99 employees
>=5 facilities within 2KM of a brgy hall

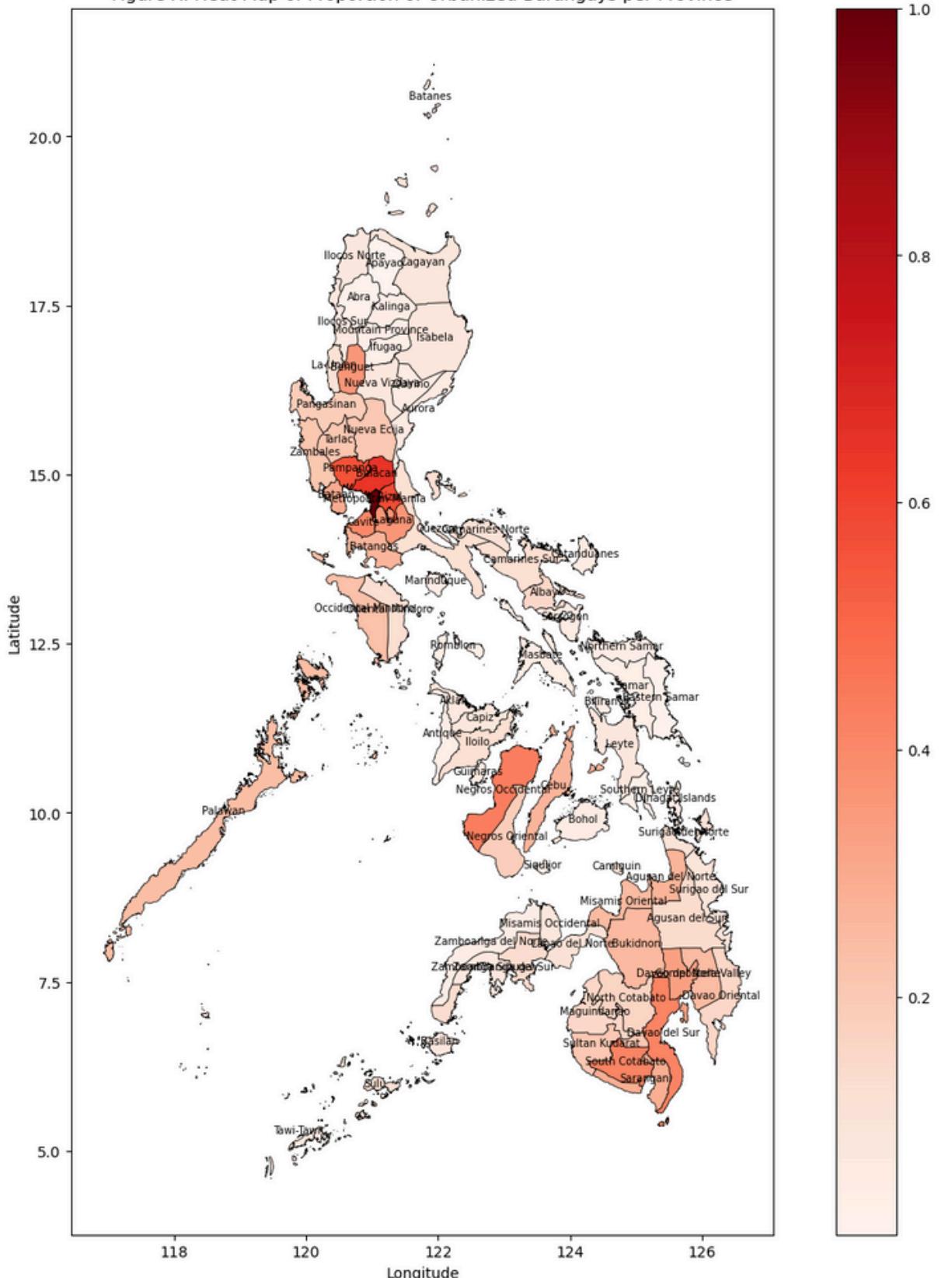
STEP THREE

Select an Urbanized Province

NAME OF PROVINCE	TOTAL BARANGAYS	URBAN BARANGAYS	% OF URBAN BARANGAYS
NCR	1,710	1,710	100%
Bulacan	569	364	64%
Rizal	189	109	58%
Pampanga	538	301	56%
Negros Occ.	662	287	43%

Data from 2020 Census of Population and Housing;
Urban tagging is based on population and number of establishments

Figure X. Heat Map of Proportion of Urbanized Barangays per Province



Manila Metro Rail Transit (MRT) Line 7, Bulacan, Philippines

Manila Metro Rail Transit (MRT) Line 7 in the Philippines is a 23km-long elevated rapid transit line under construction.

Type Metro railway line	Location Quezon City, Bulacan	Construction Started April 2016	Expected Completion 2021
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Expand ▾



MRT line 7 includes 14 elevated stations. Credit: Philippine News Agency.

Manila Metro Rail Transit (MRT) Line 7 in the Philippines is a 23km-long elevated rapid transit line under construction. The elevated line will run from North Avenue, Quezon City, to San Jose del Monte, Bulacan, and will include 14 stations. The project is owned and managed by the Philippines Department of Transportation (DOTr).

BUSINESS

3 new stations mulled on Rizal end of LRT-2

Elijah Felice Rosales - The Philippine Star [i](#)

November 1, 2022 | 12:00am



MANILA, Philippines — The Light Rail Transit Authority (LRTA) is nearing the conclusion of its feasibility study on adding three new stations to the east of the Light Rail Transit Line 2 (LRT-2) to scale up the passenger capacity of the railway.

According to LRTA deputy administrator for operations and engineering Paul Chua, the agency is finalizing the feasibility study for the Cogeo Extension Project of the LRT-2.

Chua said the project involves putting up additional three stations to the east of LRT-2 to lessen the passenger volume that builds up in the final stop, Masinag.



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"This [Cogeo Extension Project] is an extension project presently undergoing a feasibility study. This is the additional extension to the east, extended to Cogeo."

BULACAN

The Manila Metro Rail Transit (MRT) is already planning on expanding to Bulacan

RIZAL

LRT-2 line is currently extending to Rizal with potential of adding more stations there

PAMPANGA

Highly urbanized province away from NCR Transit Lines

Need for connection to Clark, San Fernando, and Angeles City

RATIONALE

There have been recent news of a push for a mass transit system to be placed in the province

PNR to Clark can connect to the Pampanga transit system

Pampanga capital pushes mass transit system to solve traffic woes

By Zorayda Tecson

November 29, 2023, 7:42 pm

Share  Share 23   

CITY OF SAN FERNANDO, PAMPANGA – The city government of San Fernando has tied up with a private firm for the establishment of a mass transit system that could address the worsening traffic situation here.

Mayor Vilma Balle-Calug signed a memorandum of understanding with Jose Christopher Fornier II, president of private firm Futran (Future of Transport) Philippines, Inc., on Tuesday as an initial step towards the realization of a bold yet long-term solution to increasing transport issues in this province's capital city.

Balle-Calug said a feasibility study which will run for six to 12 months will be conducted to determine the technical and financial viability of the project.

The mass transit system called "People Mover Project" comprises a suspended podcar rail system that features a "green concept" involving sustainable and renewable energy through the use of solar panels.

"This will address the continuing traffic congestion amid the increasing size of the workforce, building clients and tourists in the city," Calug said in a statement on Wednesday.

The city government has been discussing various measures with different sectors to address the escalating traffic problems.

Among these are the modification of the scope and timing of the truck restriction in the city as well as the changing of the students and employees' schedules.

Last week, Calug issued an executive order for the implementation of a four-day compressed work week for office-based transactions and services as an alternative work arrangement effective Dec. 4.

She said the move is one of the city's proactive measures to address traffic congestion.

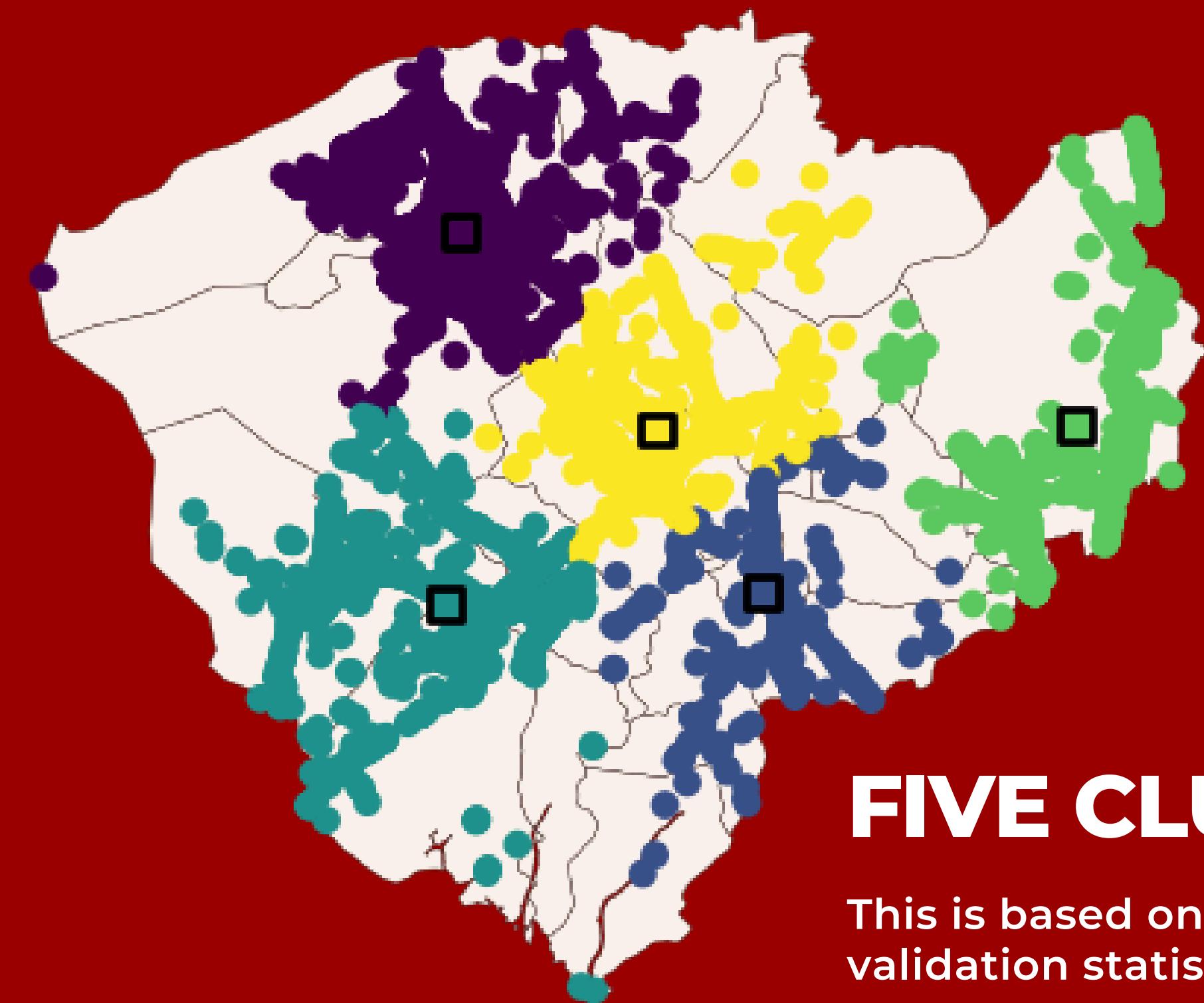
However, regular operations of offices whose functions involve the delivery of health services, social welfare and development services, peace and order, and response to disasters/calamities shall still be implemented. (PNA)



MASS TRANSIT SYSTEM. A photo of a suspended podcar rail system presented by private firm Futran (Future of Transport) Philippines, Inc. during the signing of an agreement with the city government of San Fernando, Pampanga on Tuesday (Nov. 28, 2023) for the establishment of a mass transit system in the city. The partnership is an initial step towards the realization of a long-term solution to the worsening traffic situation in the city. (Photo courtesy of the city government of San Fernando)

STEP FOUR

Cluster the data points using
Kmeans, then generate centroids



FIVE CLUSTERS

This is based on the what internal validation statistics is suggesting

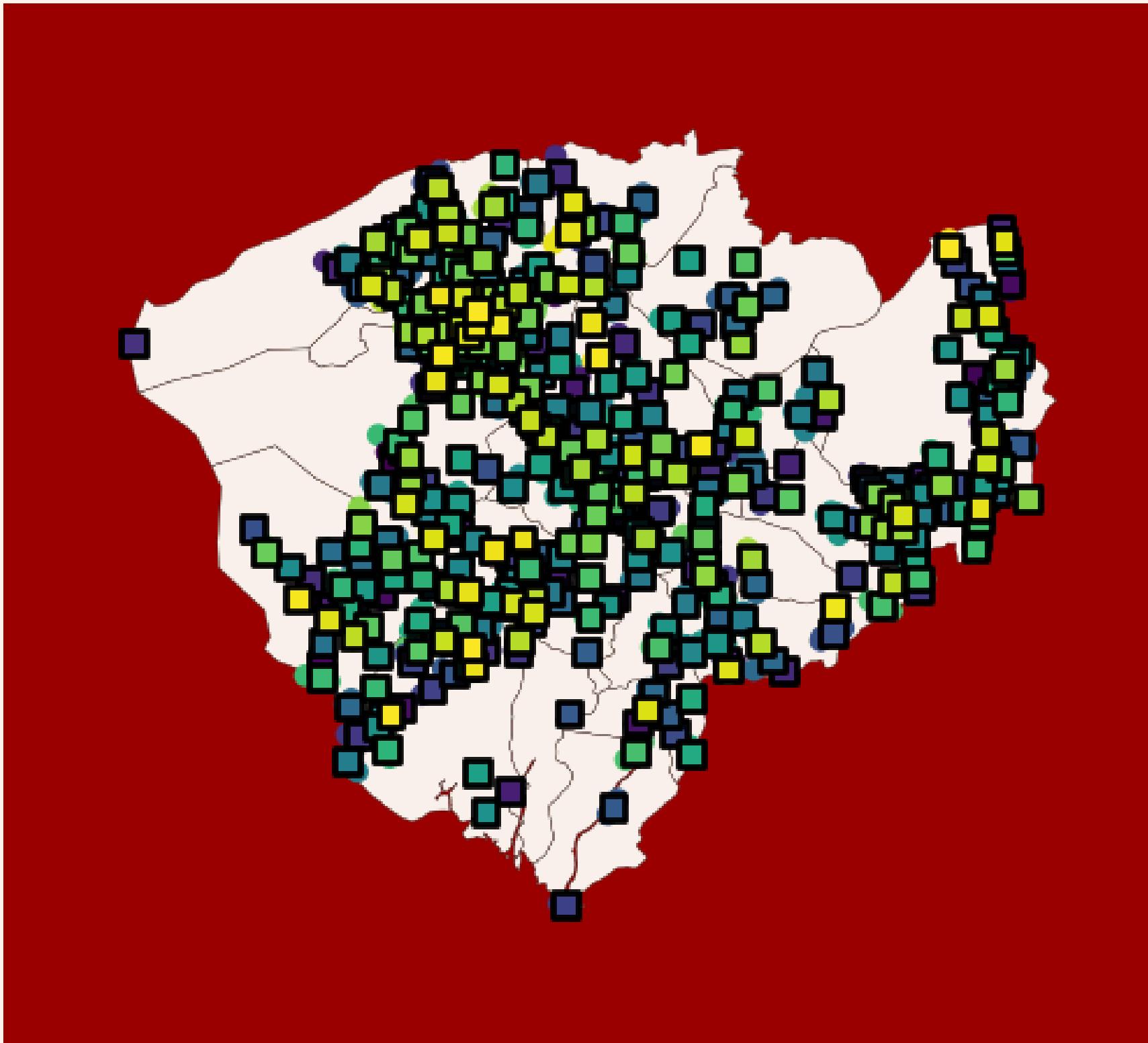
HELL NO!

**It doesn't make sense to
rely on the interval
validation statistics...**

STEP FIVE

Determine the ideal number of stations to be placed

BASED ON LITERATURE: 499 TRAIN STATIONS



499 CLUSTERS

Based on literature where there should be a station every 800 m

The number of stations is maximized using this distance threshold and usable land area

UNREALISTIC

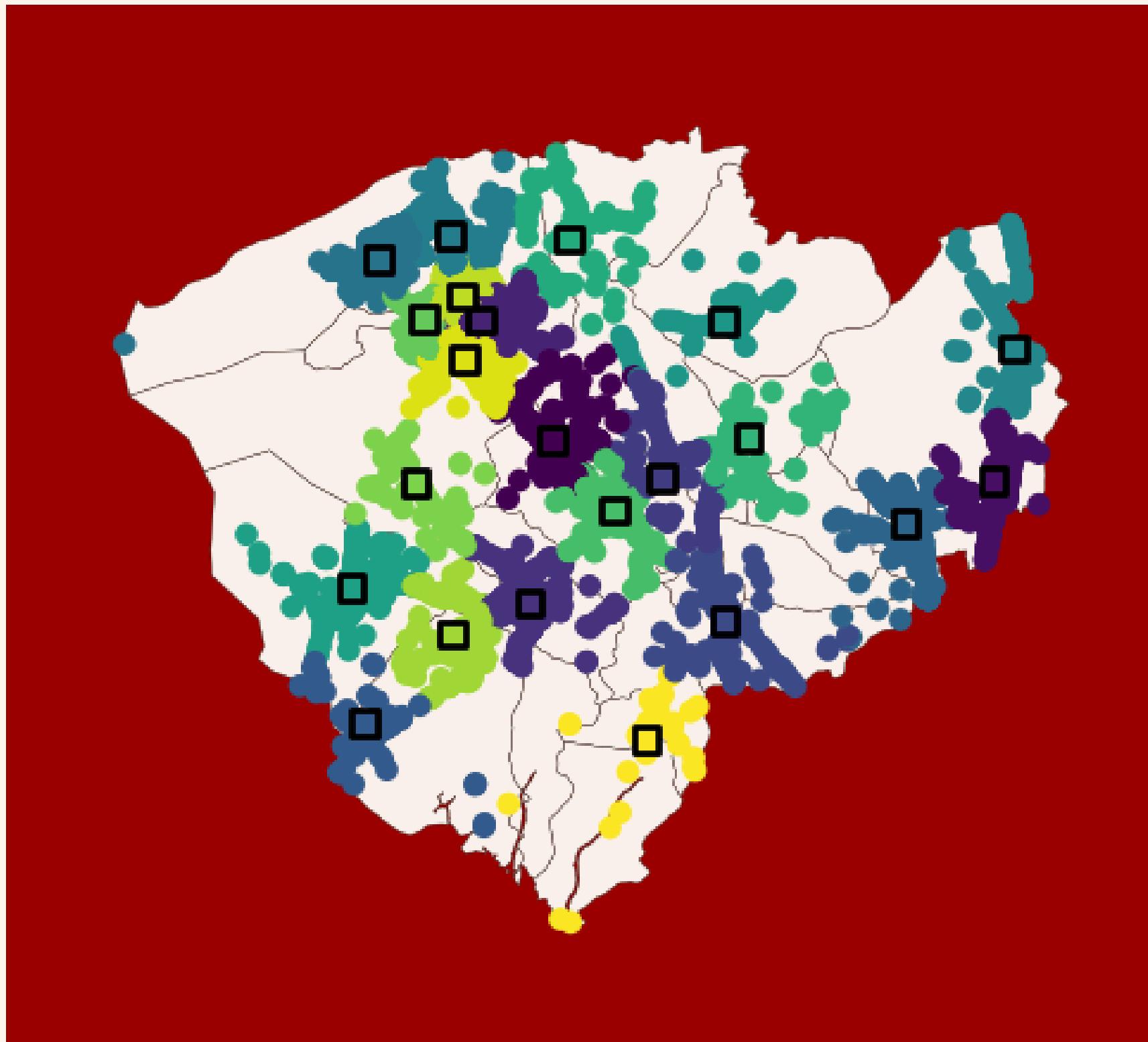
Pampanga is a rich province, but not rich enough to build 499 train stations within the province

And it would take an extremely long time to do this

HELL NO!

**It is not feasible to make
499 stations, given
budget constraints.**

MOST REALISTIC: 22 TRAIN STATIONS



REASON 1

Pampanga does not have enough funds to have train stations every 800 meters

REASON 2

It is believed that by just connecting the cities is enough. Therefore, the number of stations should equal that

SNAPSHOT OF LOCATION OF TRAIN STATIONS



CANDABA STATION

15° 1' 30.648"N 120° 52' 42.924"E



MASANTOL STATION

14° 53' 13.812"N 120° 42' 36"E



THANK YOU!
THANK YOU!
THANK YOU!
THANK YOU!