



83rd International Scientific
Conference of the
University of Latvia **2025**

S P A T I O T E M P O R A L
C H A N G E S I N L A N D U S E
A N D L A N D C O V E R

Mayte Cuesta, PhD Student

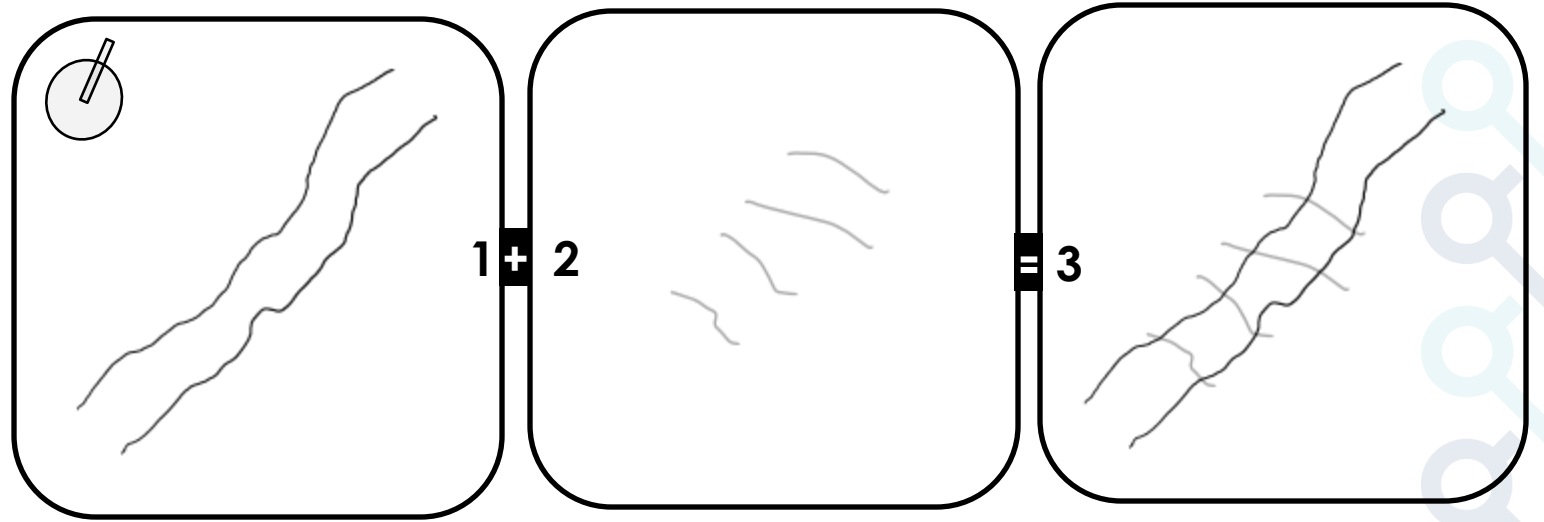
Hungarian University of Agriculture and Life Sciences
(MATE)

CONTENT

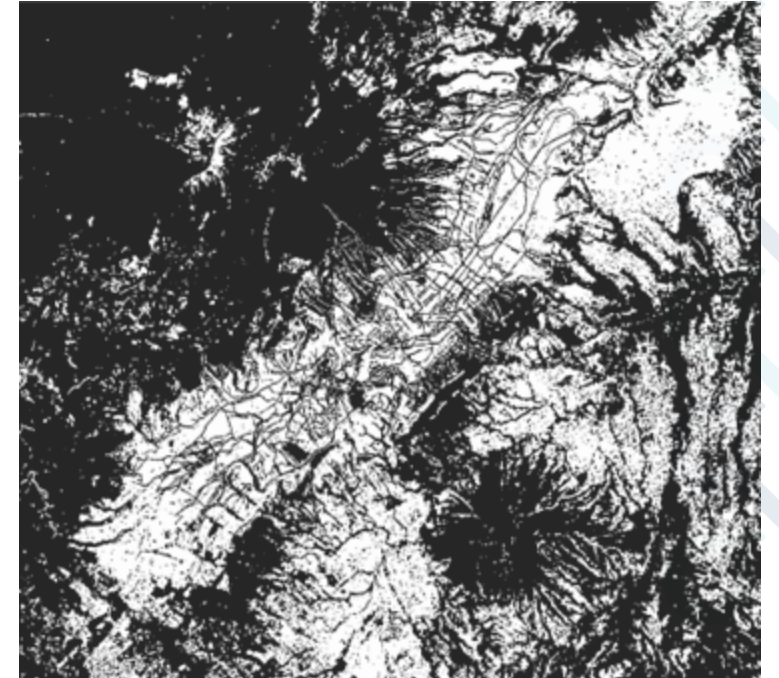
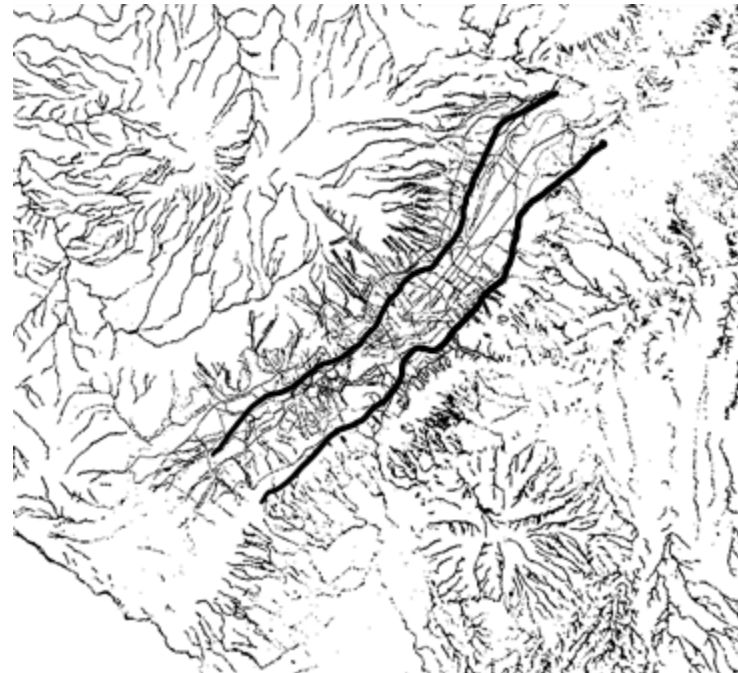
1. Introduction
2. Research Objectives
3. Methodology
4. Study Area
5. LULC analysis
6. Discussion and Conclusions



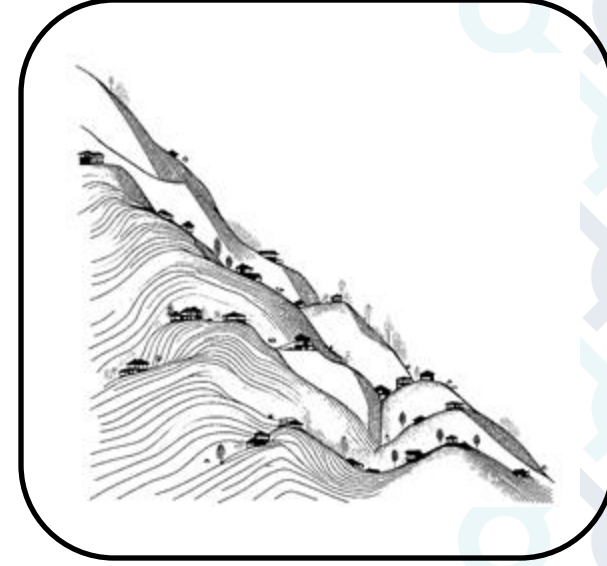
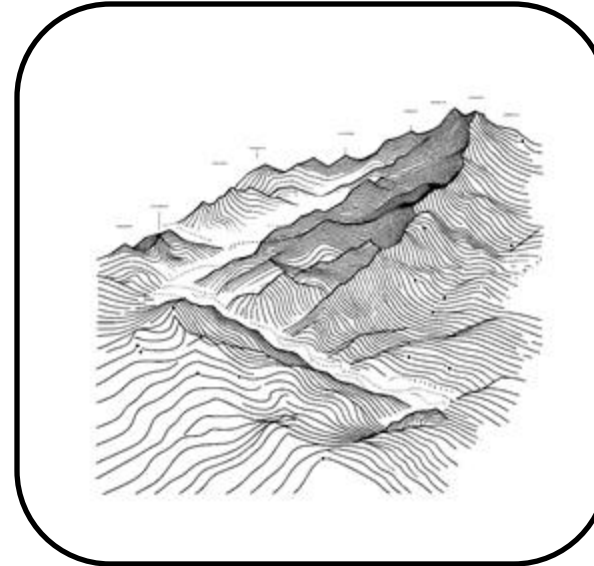
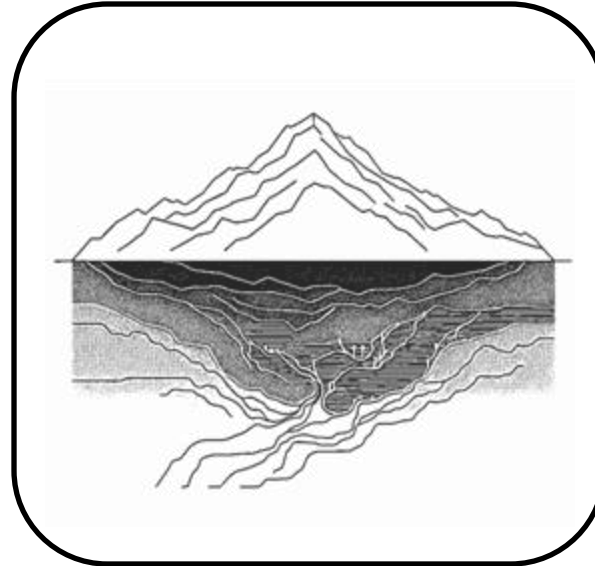
1.INTRODUCTION



QUITO'S GEOMORPHOLOGY AND ITS IMPORTANCE IN THE CITY CONFIGURATION



1.INTRODUCTION



**Quito's
geomorphology**

**Slopes, rivers,
streams and the
urbanization
processes**

**Growth patterns
Informality and risk**

QUITO'S BACKGROUND



RESEARCH OBJECTIVES

1

To determine and examine spatiotemporal changes in land use and land cover (LULC) from 2016 to 2024

2

To measure the intensity of land cover alterations involved during the informal settlement expansion process

3

To link the informal settlement growth patterns with processes in land transitions, along with related municipality policy factors



METHODOLOGY

1. DATA COLLECTION

Sentinel-1 (2016-2014)

2. IMAGE PROCESING

3. CLASSIFICATION

object-based, clusters, categories (informal settlements, urban areas, water, and vegetation.)

4. CHANGE DETECTION

Matrix how different categories changed (areas transformed into informal)

5. INTENSITY ANALYSIS

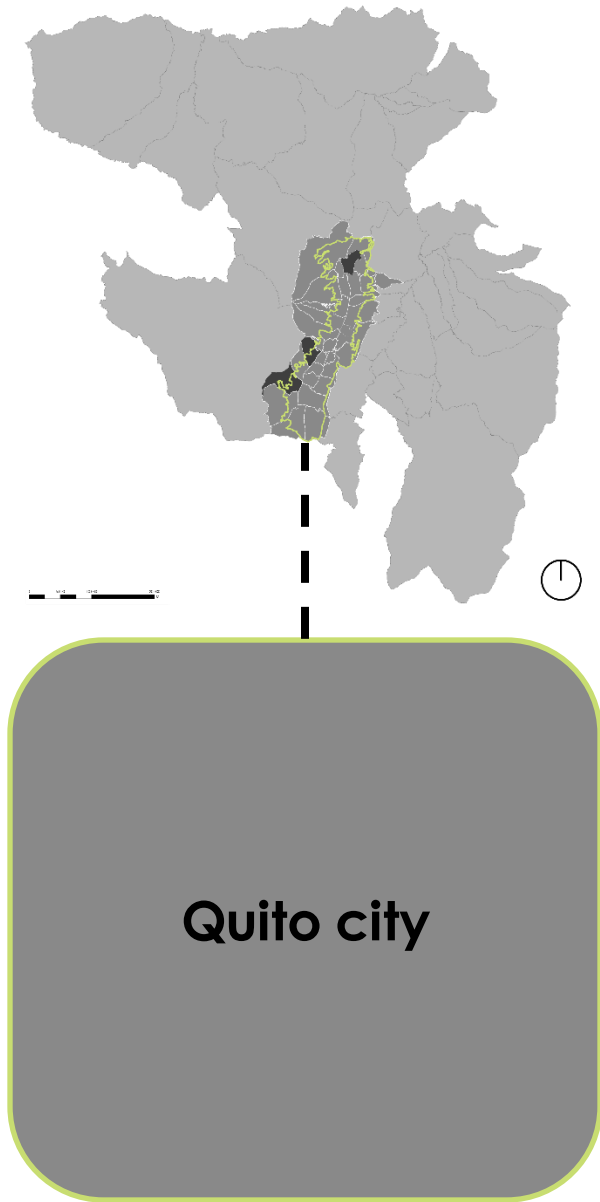
How much land was gained or lost in each category (patterns of transition)

6. CATEGORY AND TRANSITION ANALYSIS

Overall changes in land categories and the specific transitions between them (dynamics of IS in relation to other urban areas)



STUDY AREA



PONCEANO

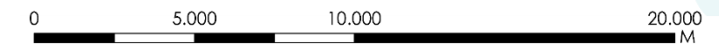
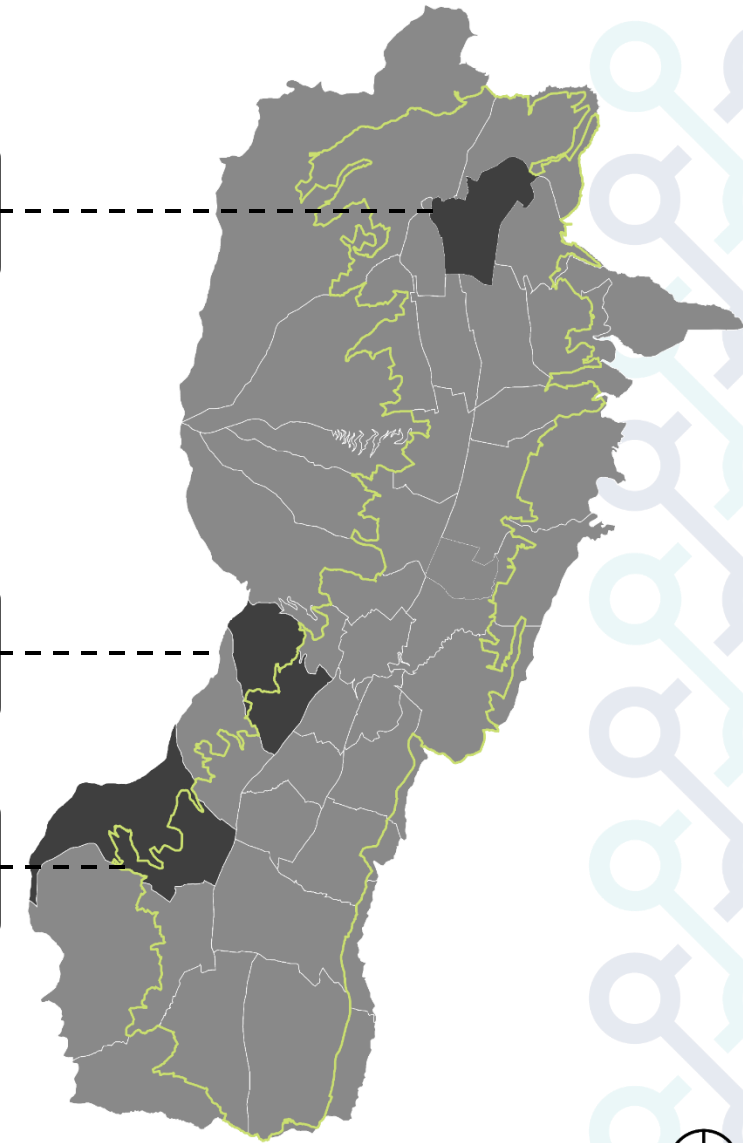
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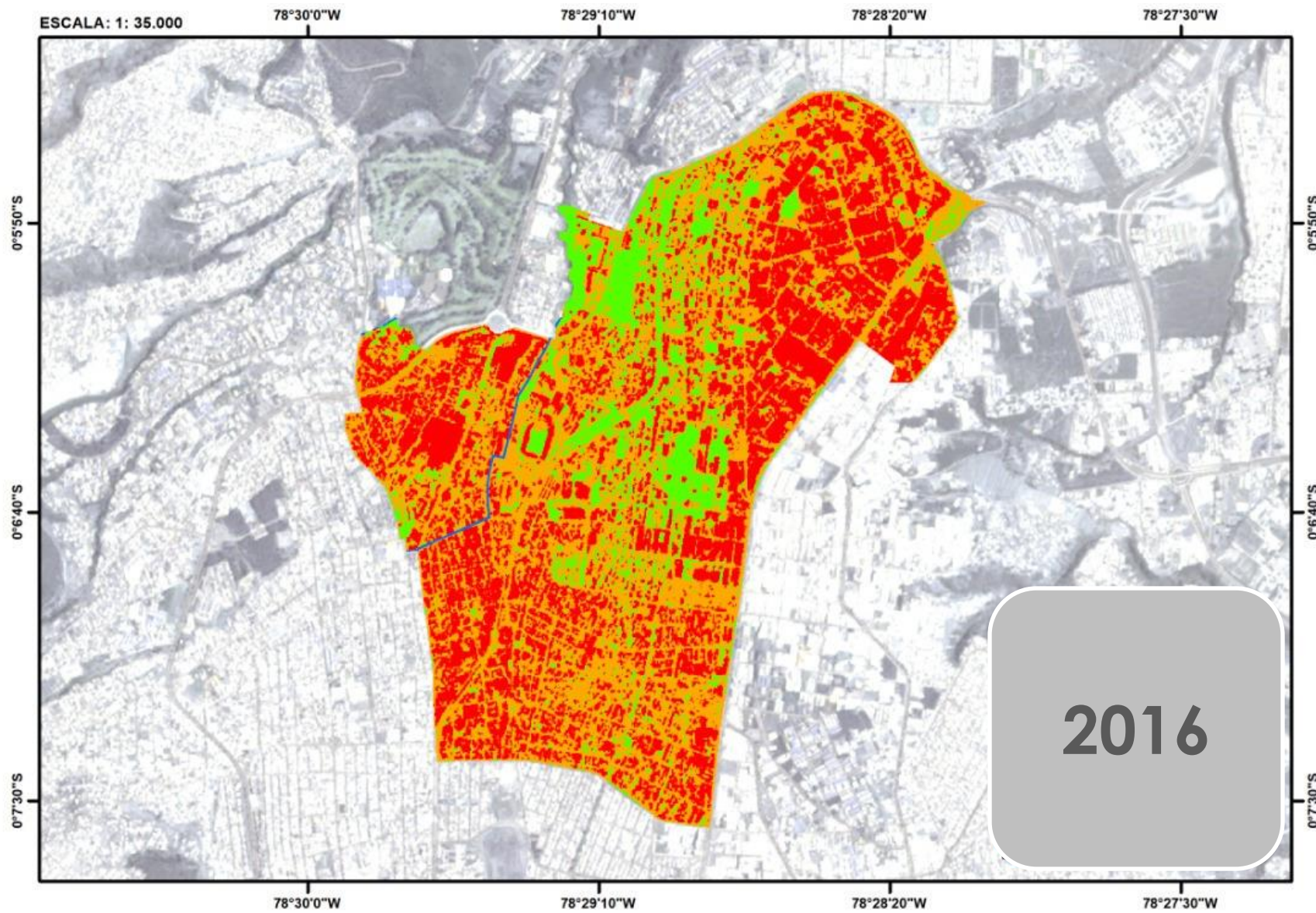
CHILIBULO

2

CHILLOGALLO

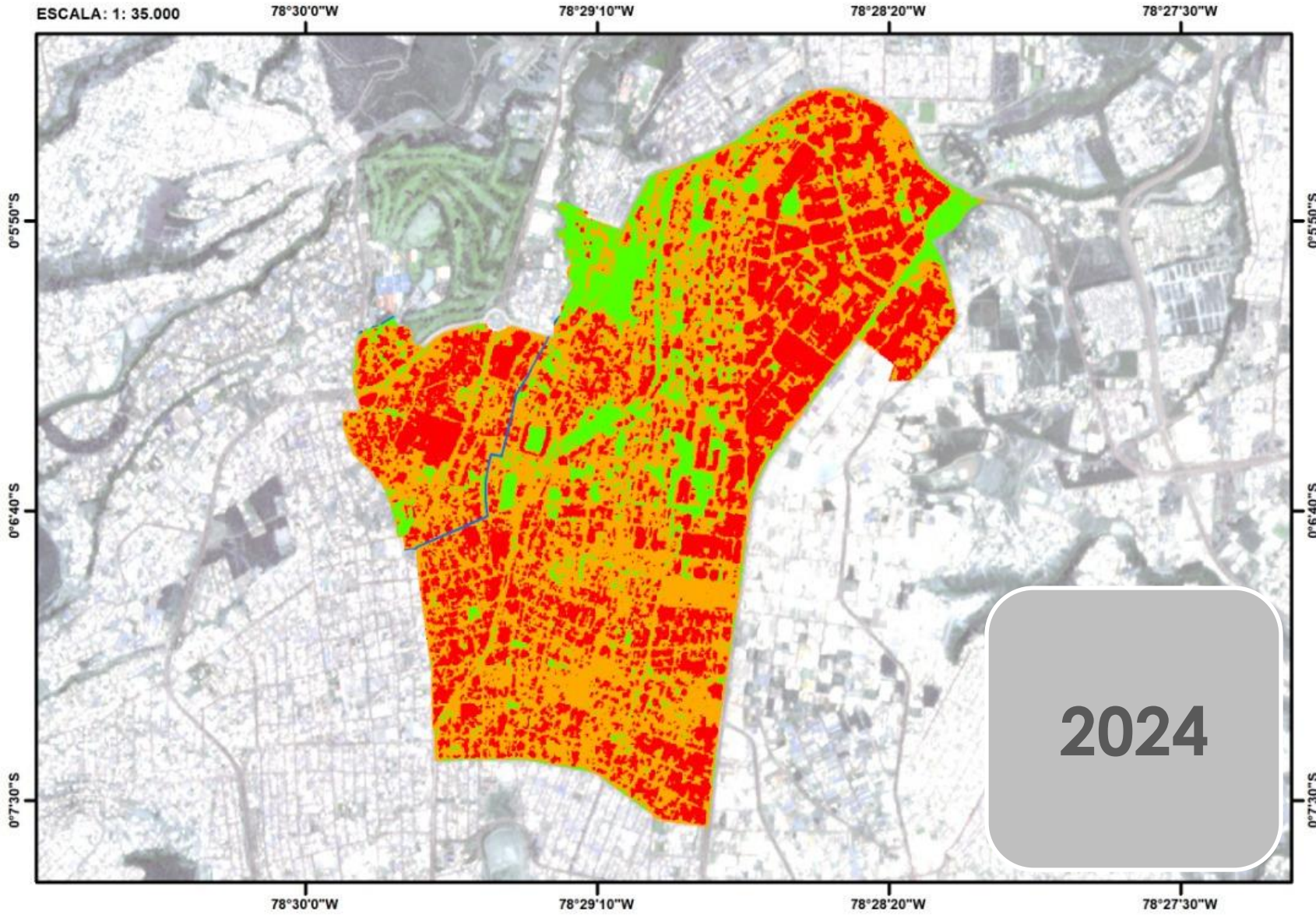
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1.PONCEANO

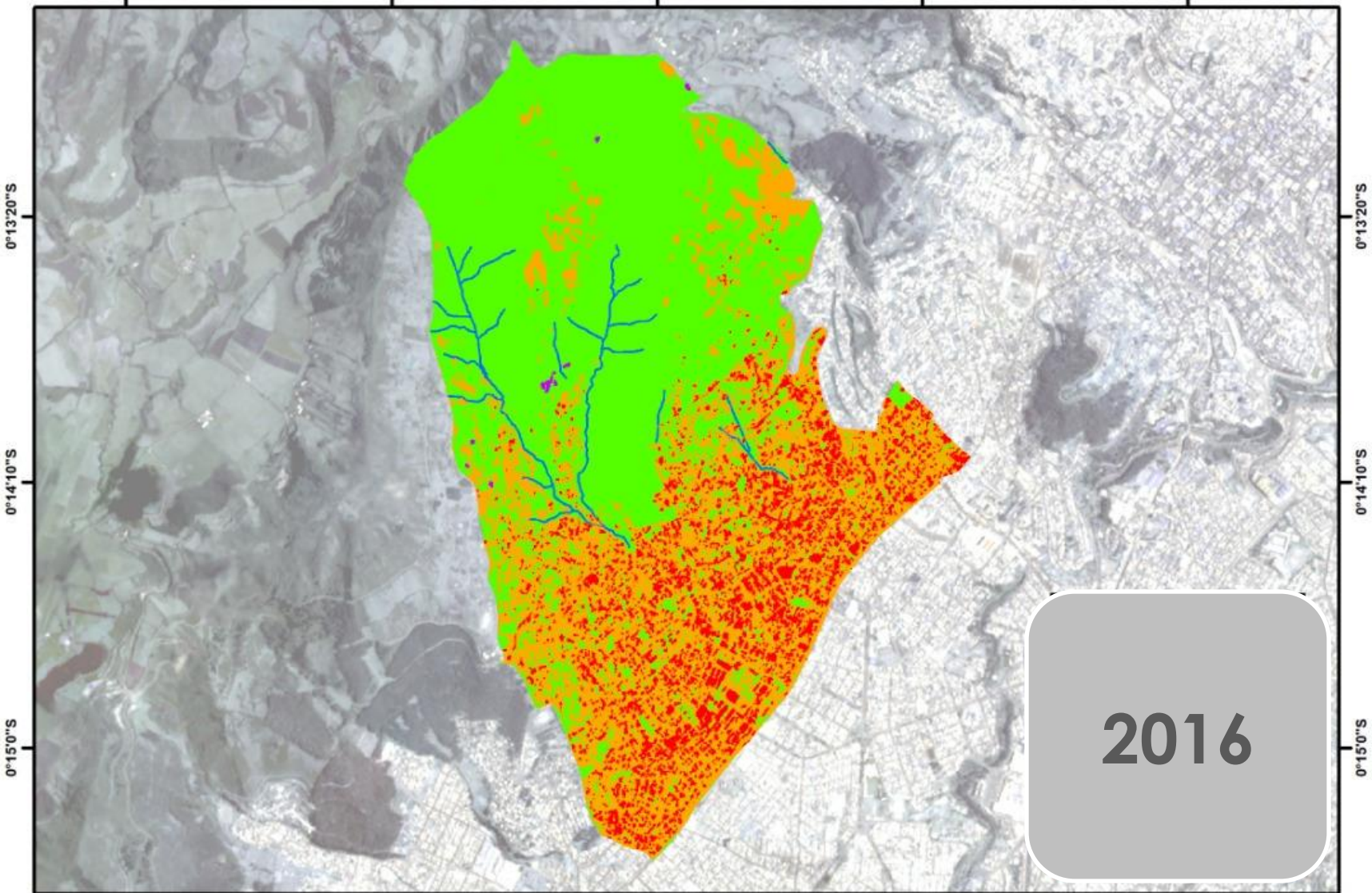




1. PONCEANO



78°34'10"W ESCALA: 1: 40.000 78°33'20"W 78°32'30"W 78°31'40"W 78°30'50"W

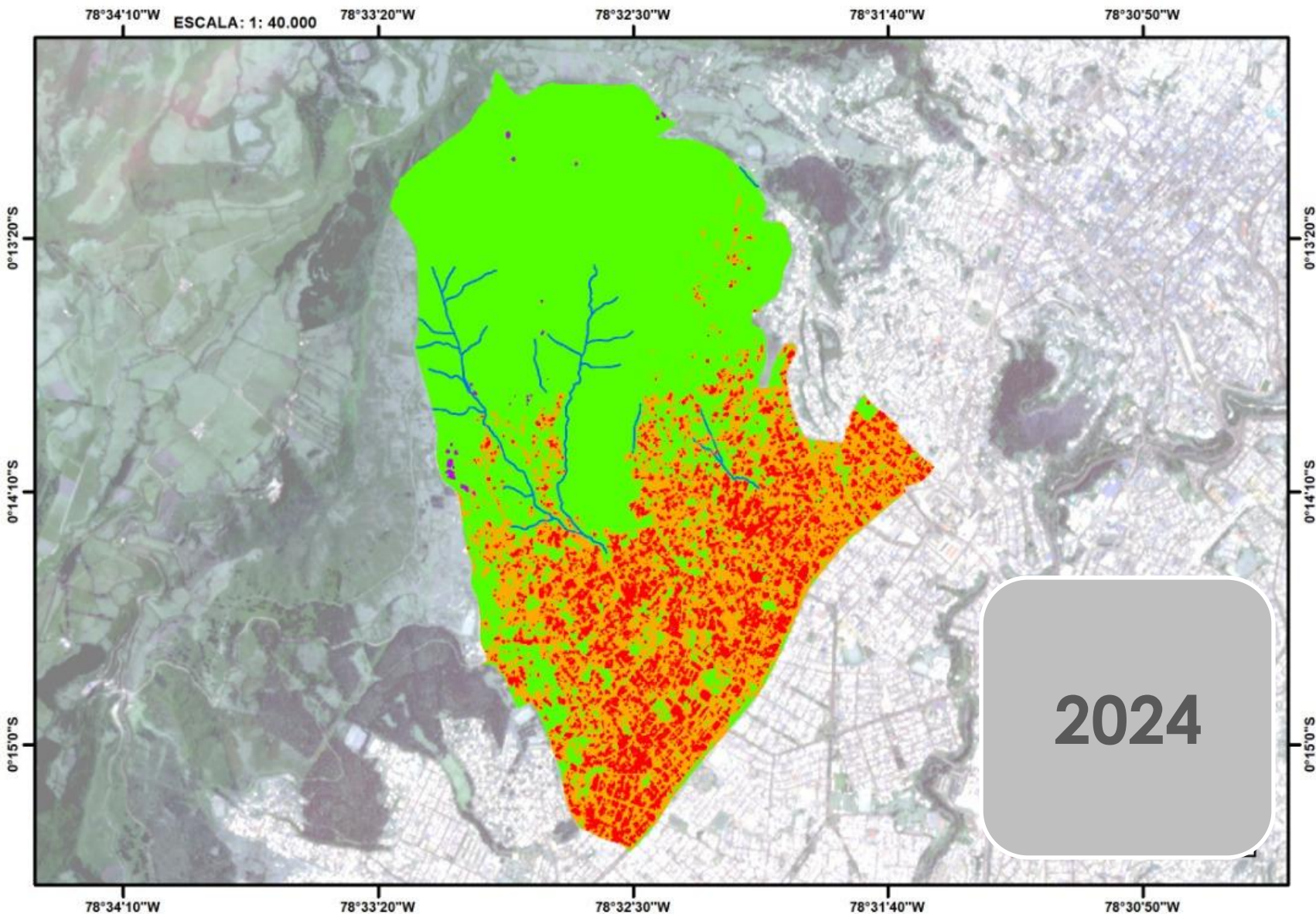


2016

2. CHILIBULO

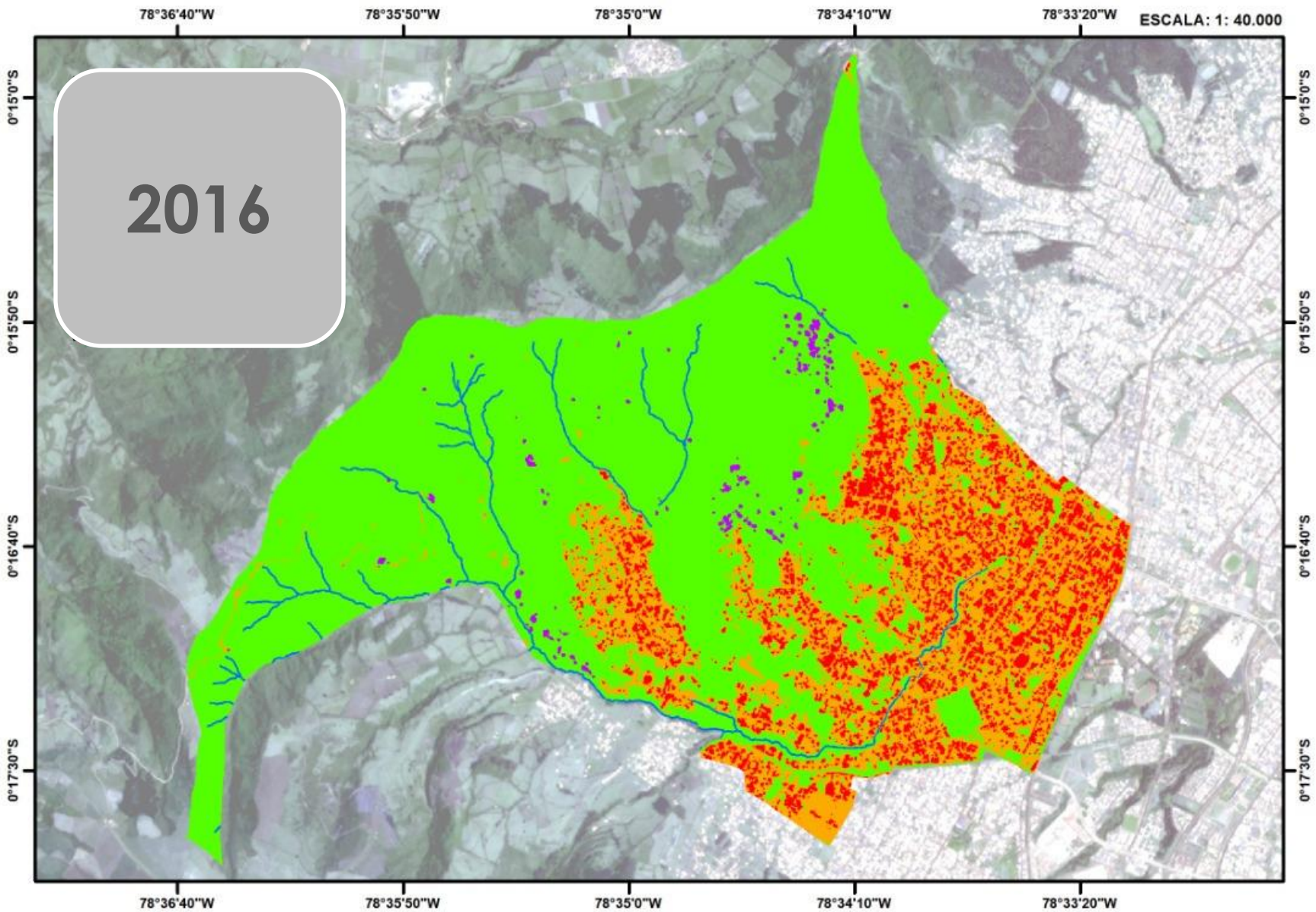


78°34'10"W 78°33'20"W 78°32'30"W 78°31'40"W 78°30'50"W



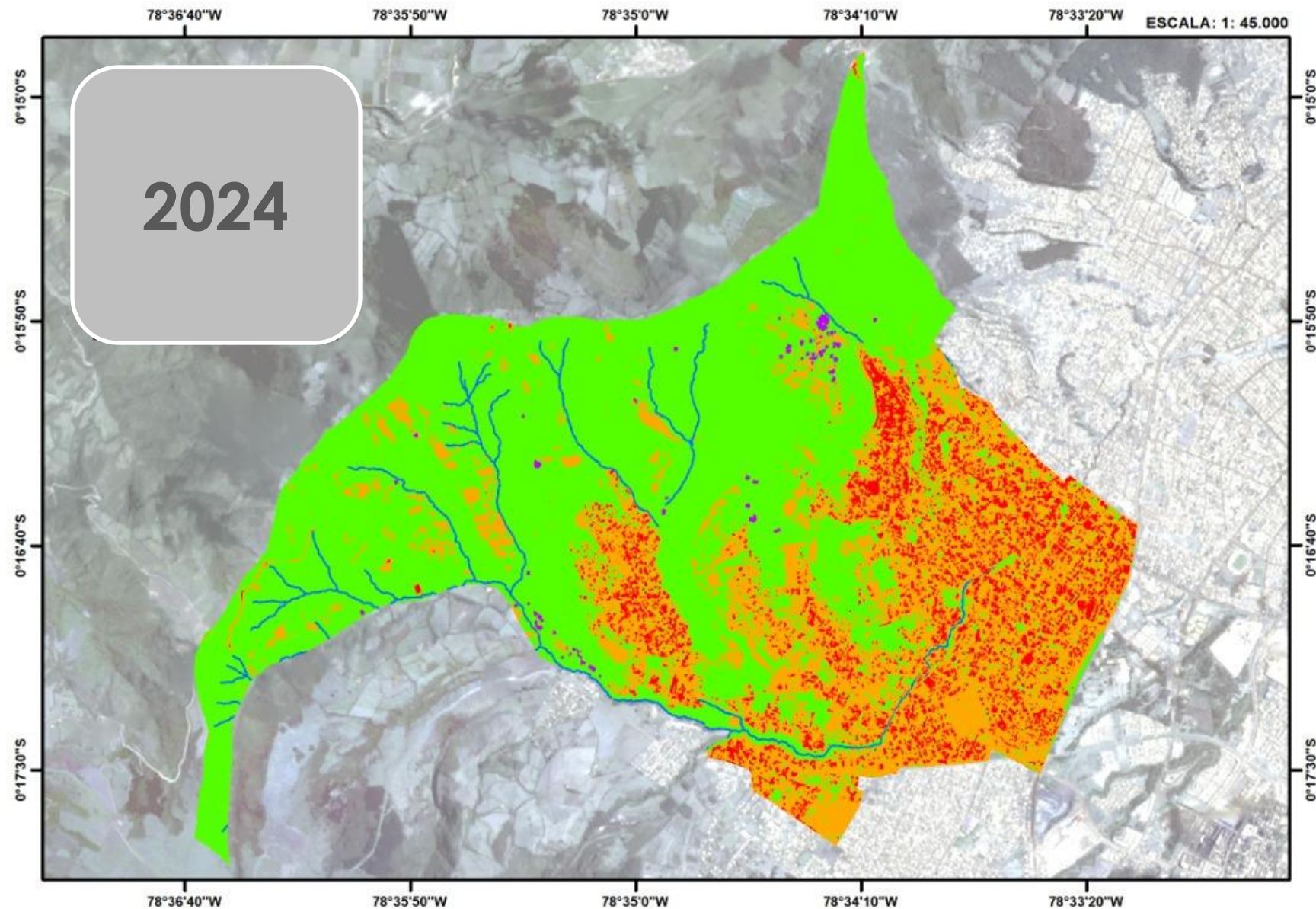
2. CHILIBULO





3. CHILLOGALLO



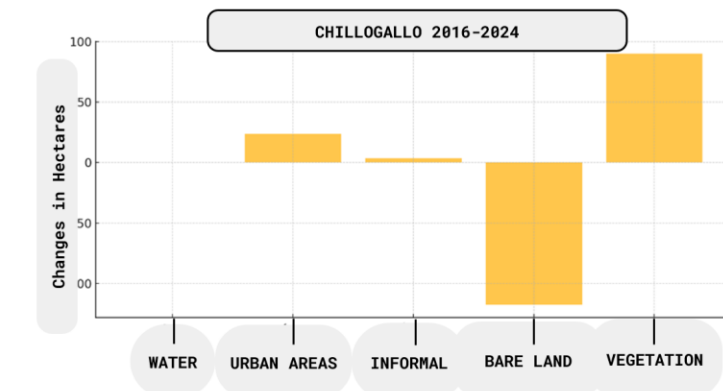
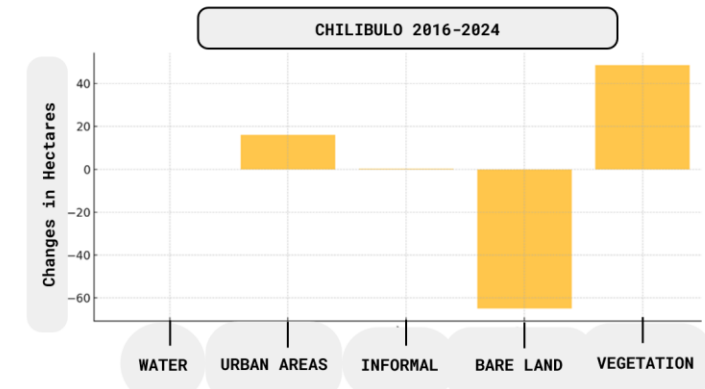
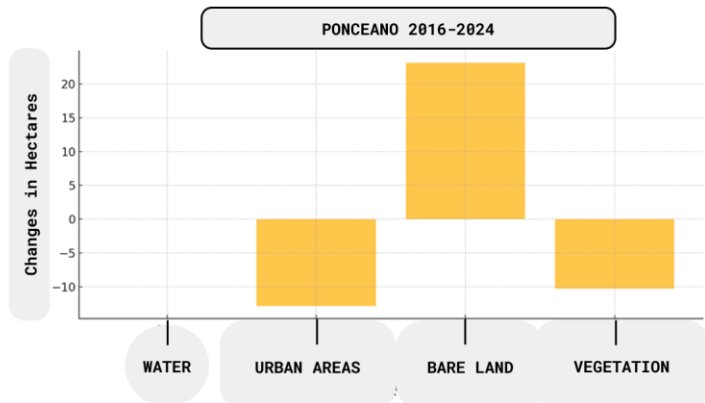


3. CHILLOGALLO



Location	Urban Areas	Bare Land	Vegetation	Informal	Water
1. PONCEANO	Slight decrease of approximately 13 hectares, possibly due to classification changes or loss of urban areas.	Increase of more than 23 hectares, possibly due to deforestation or land abandonment.	Decrease of 10 hectares, suggesting conversion to other categories.	Remains constant, no changes.	Remains constant, no changes.
2. CHILIBULO	Increase of 16 hectares, reflecting urban expansion.	Significant decrease of approximately 65 hectares, possibly related to urbanization or vegetation recovery.	Increase of nearly 49 hectares, highlighting possible environmental conservation efforts.	Slight increase, showing growth in unplanned areas.	Remains constant, no changes.
3. CHILLOGALLO	Significant increase of approximately 24 hectares, indicating urban growth.	Notable decrease of more than 117 hectares, likely due to urbanization or reforestation.	Increase of approximately 90 hectares, possibly indicating reforestation or natural area recovery efforts.	Considerable increase, but still a minor category compared to others.	Remains constant, no changes.





OBSERVATIONS

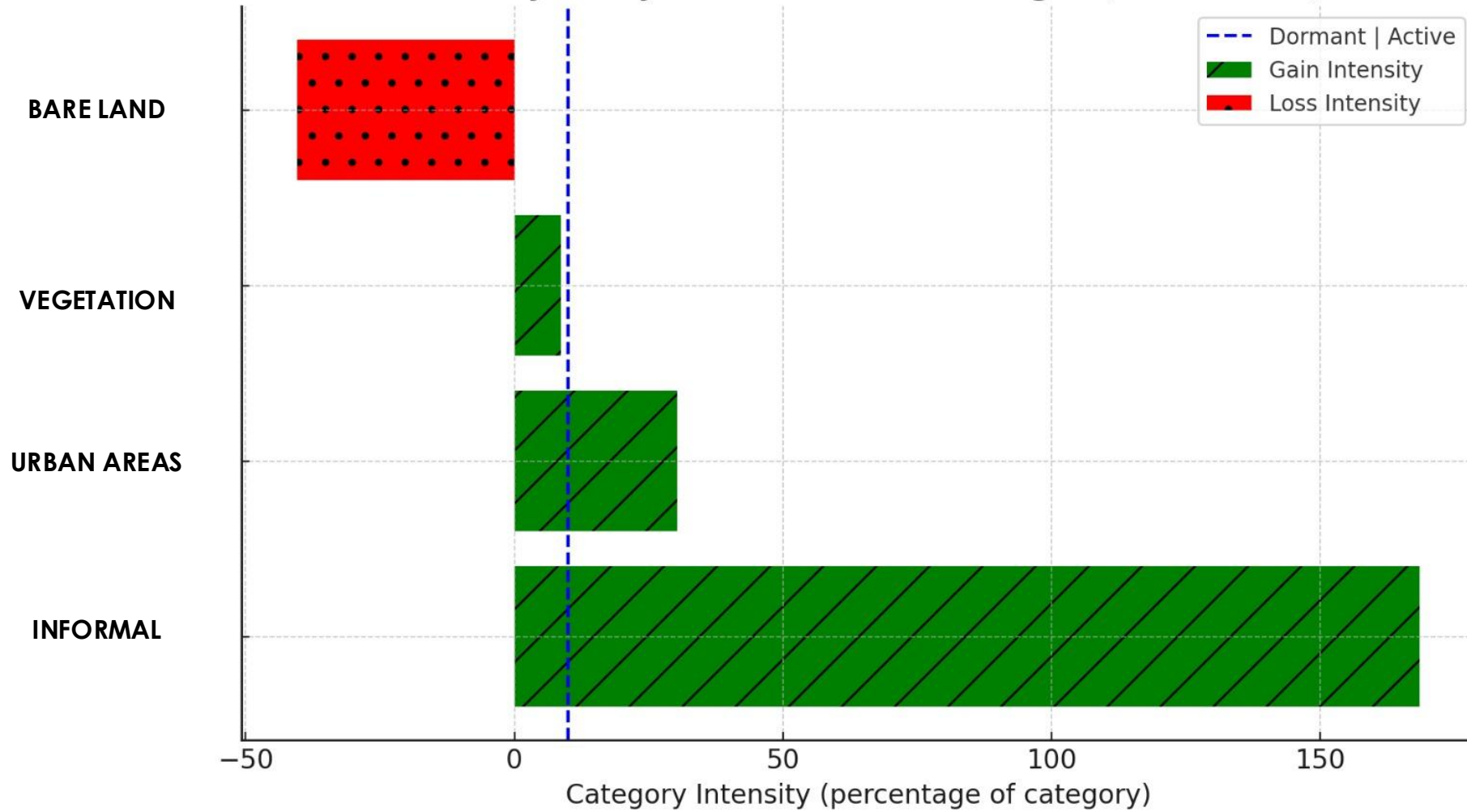
1. The loss of vegetation and the increase in bare land could be signs of deforestation or changes in land use. The decrease in urban areas may be the result of administrative changes or classification adjustments.

2. Moderate urban growth and an increase in vegetation, which could indicate a focus on reforestation or environmental improvement. The significant decrease in bare land points to a substantial conversion to other uses.

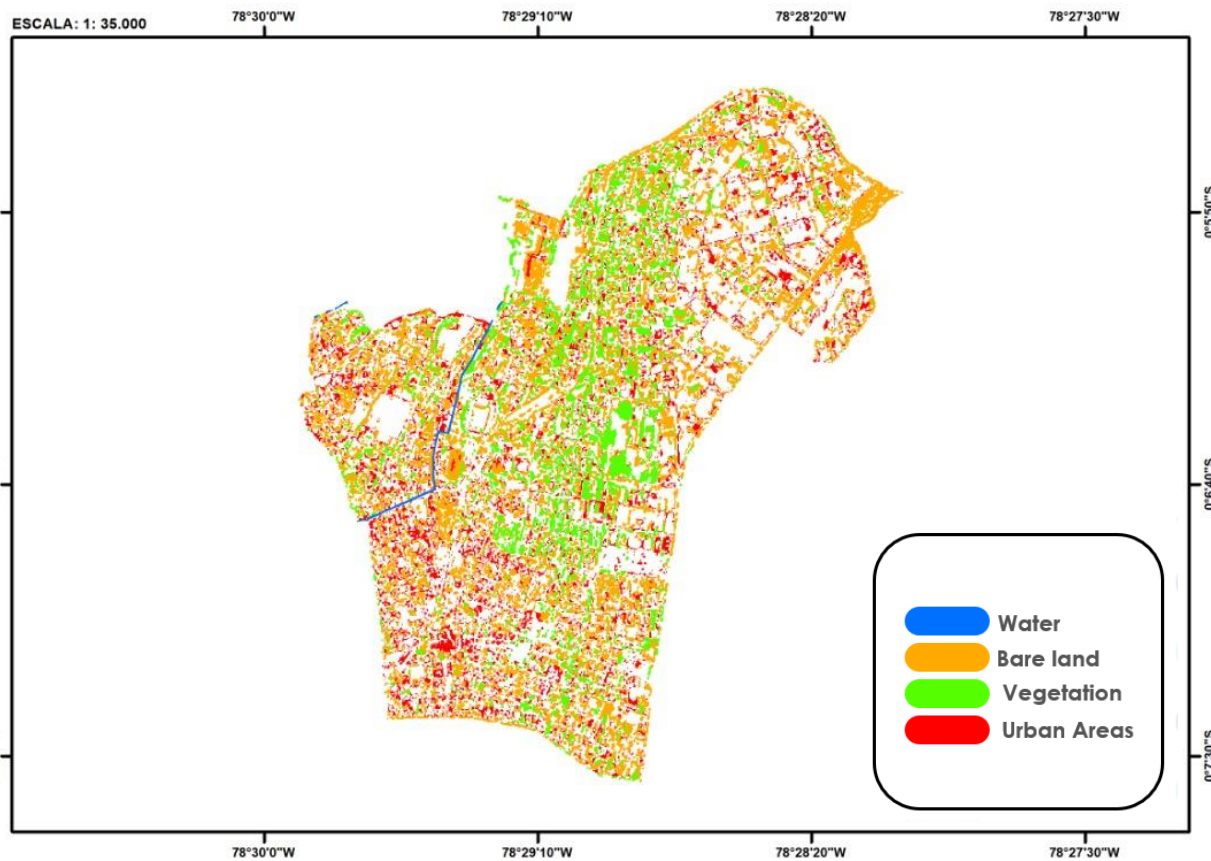
3. They show a clear trend toward a decrease in bare land and an increase in both urban areas and vegetation, suggesting a balance between urbanization and conservation.



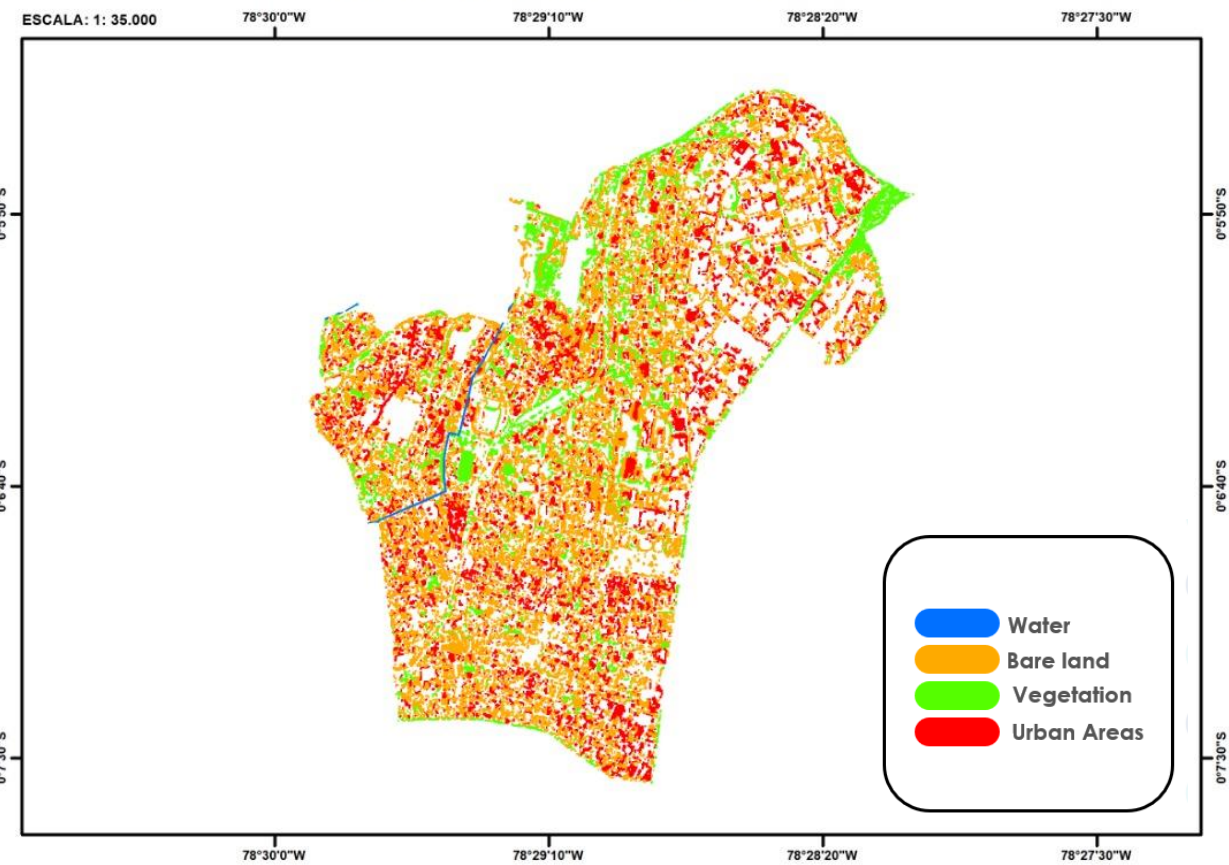
Intensity Analysis of Land Use Changes (2016-2024)



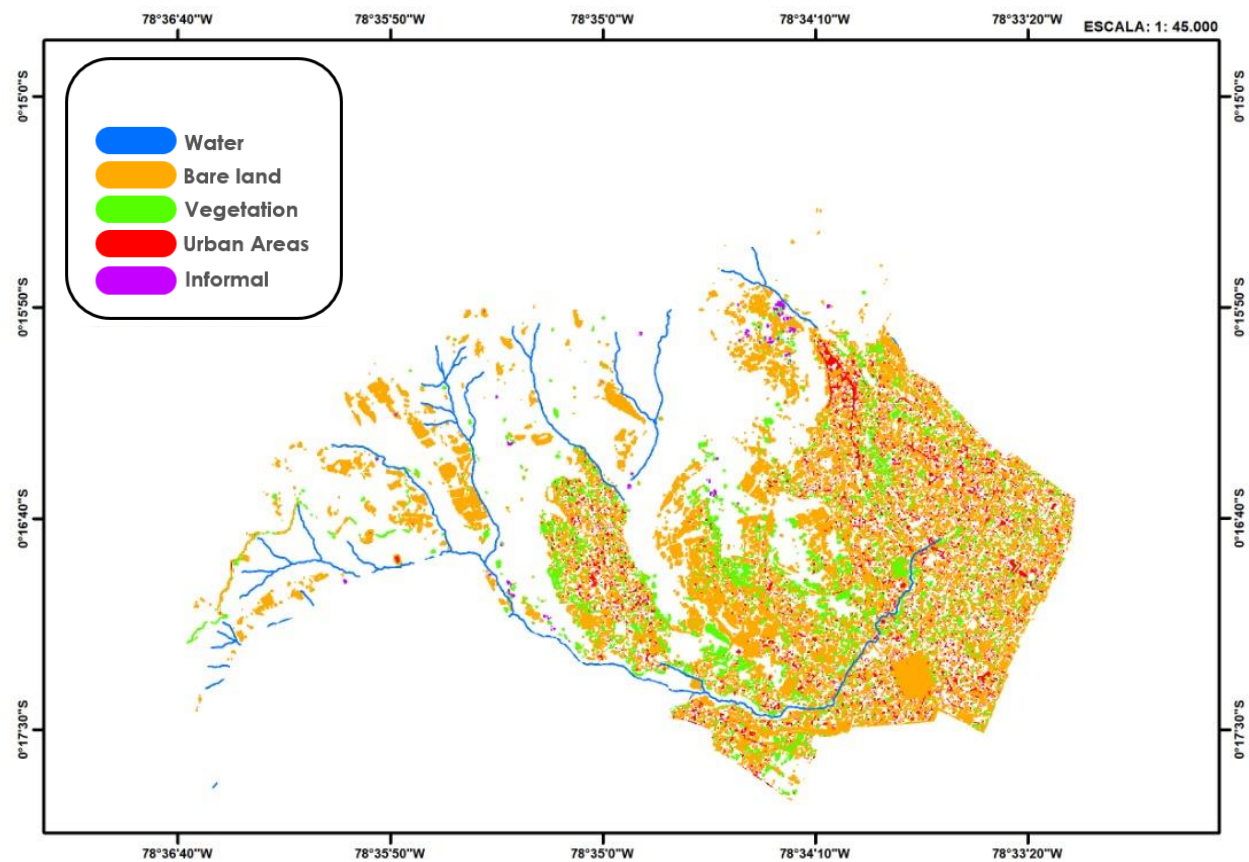
LOSS PONCEANO 2016 - 2024



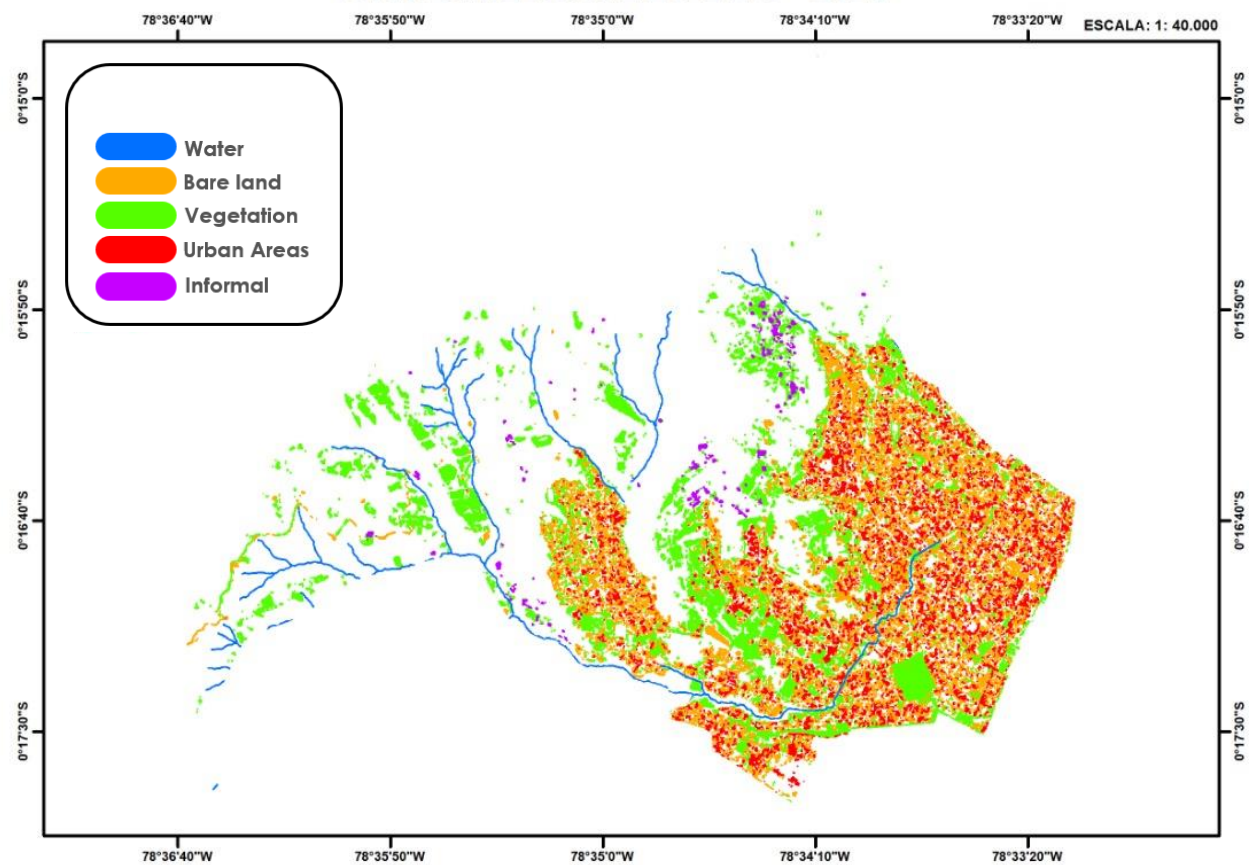
GAIN PONCEANO 2016 - 2024



LOSS CHILLOGALLO 2016 - 2024

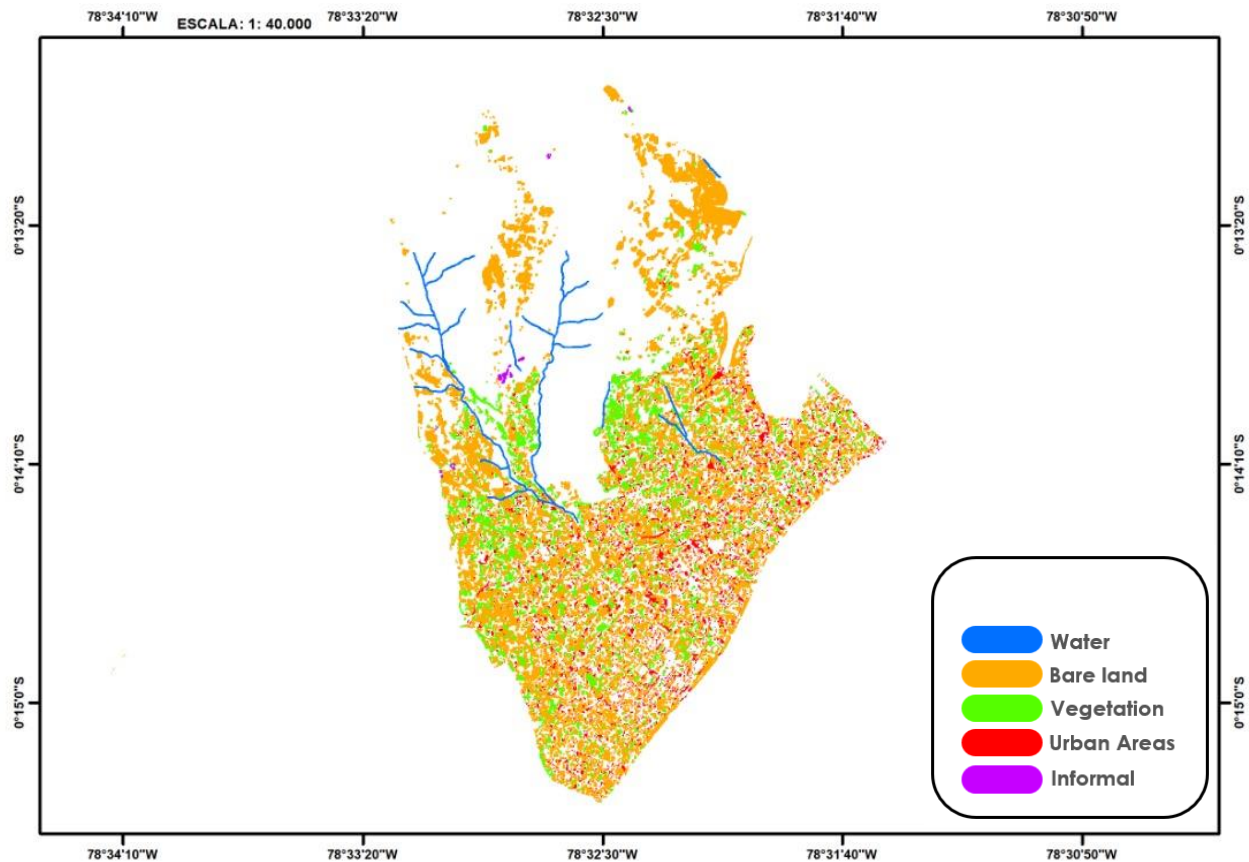


GAIN CHILLOGALLO 2016 - 2024

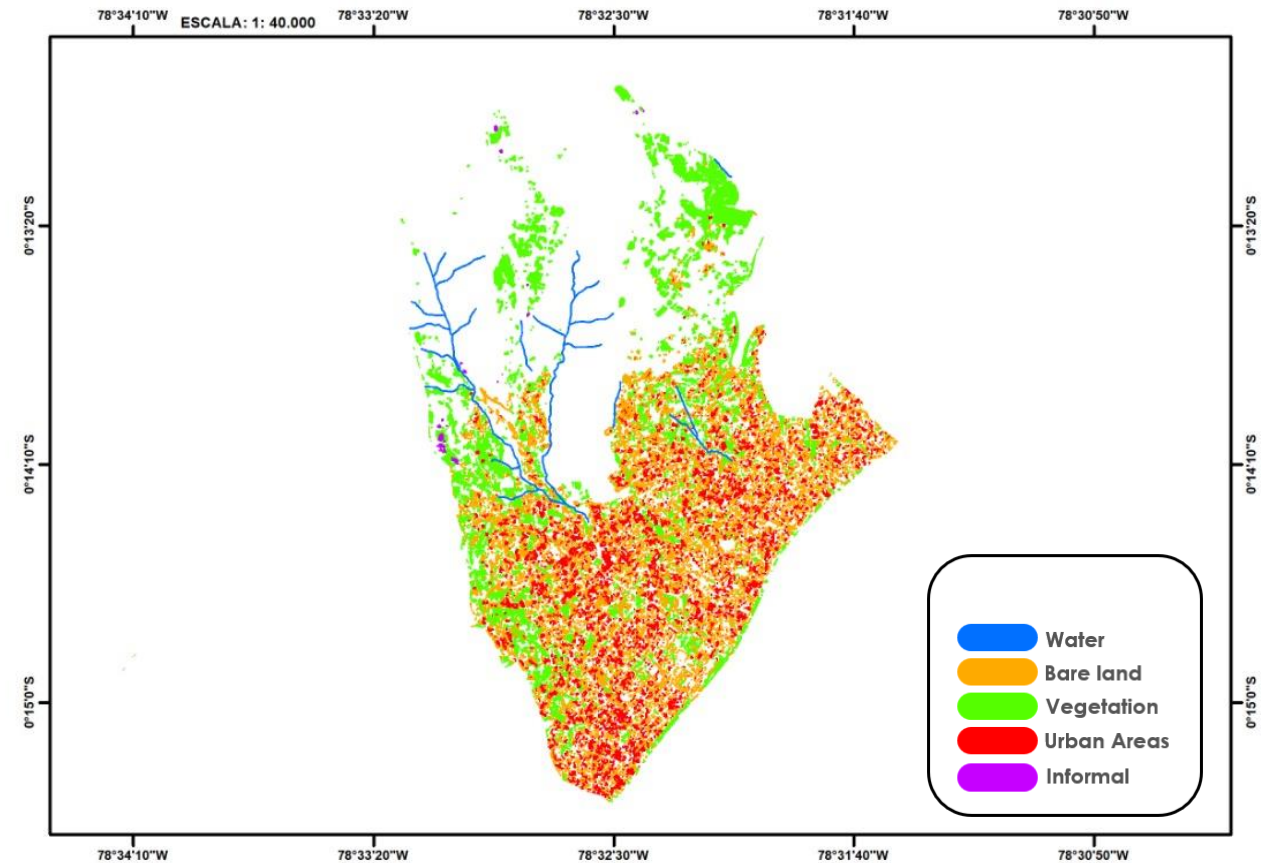




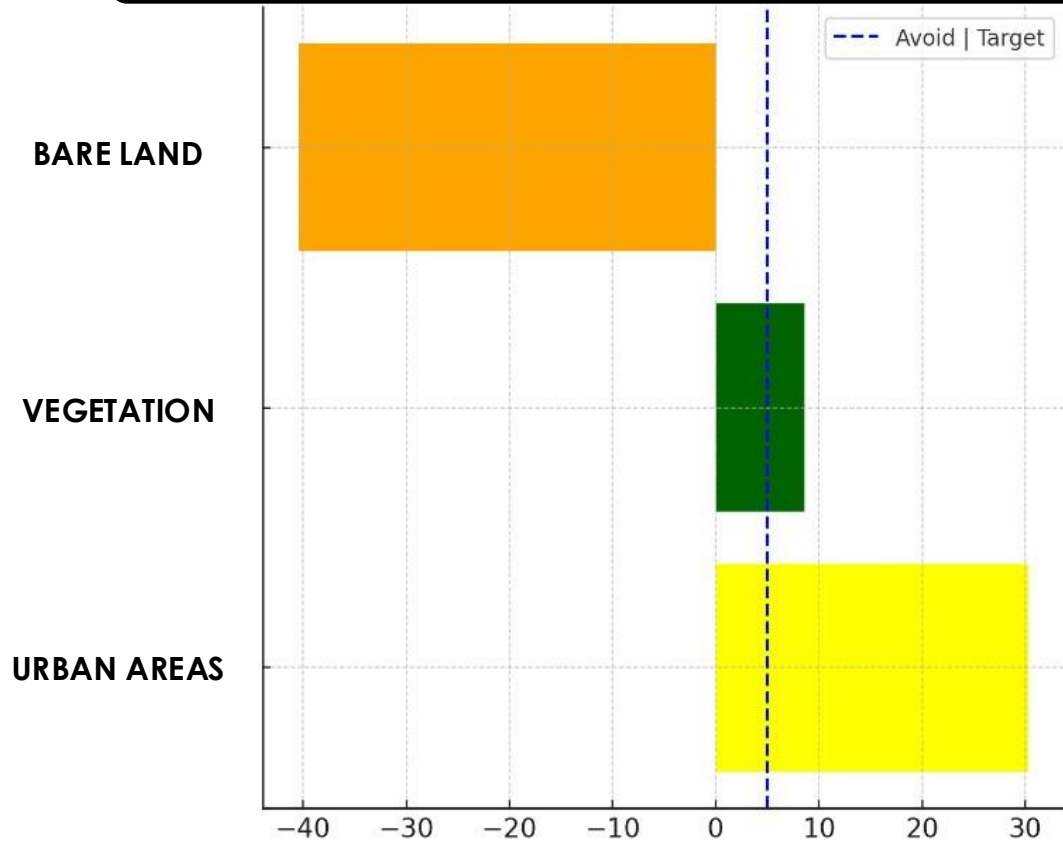
LOSS CHILIBULO 2016 - 2024



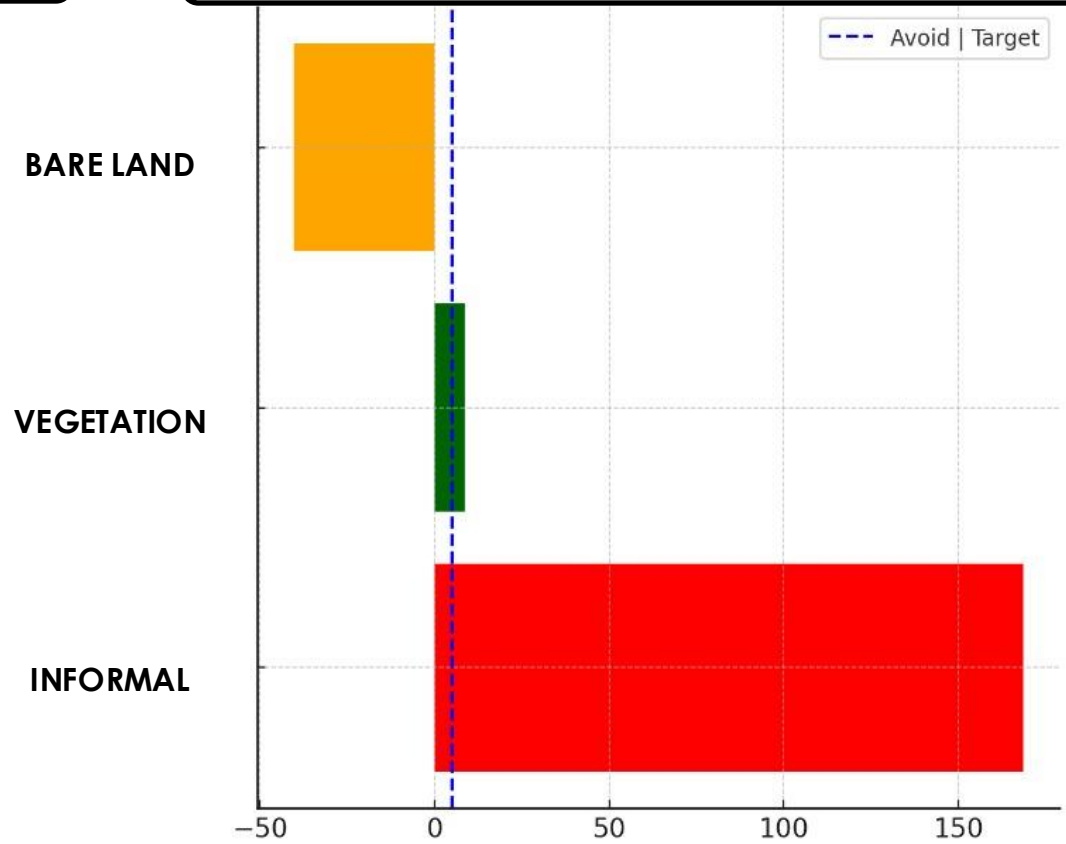
GAIN CHILUBULO 2016 - 2024



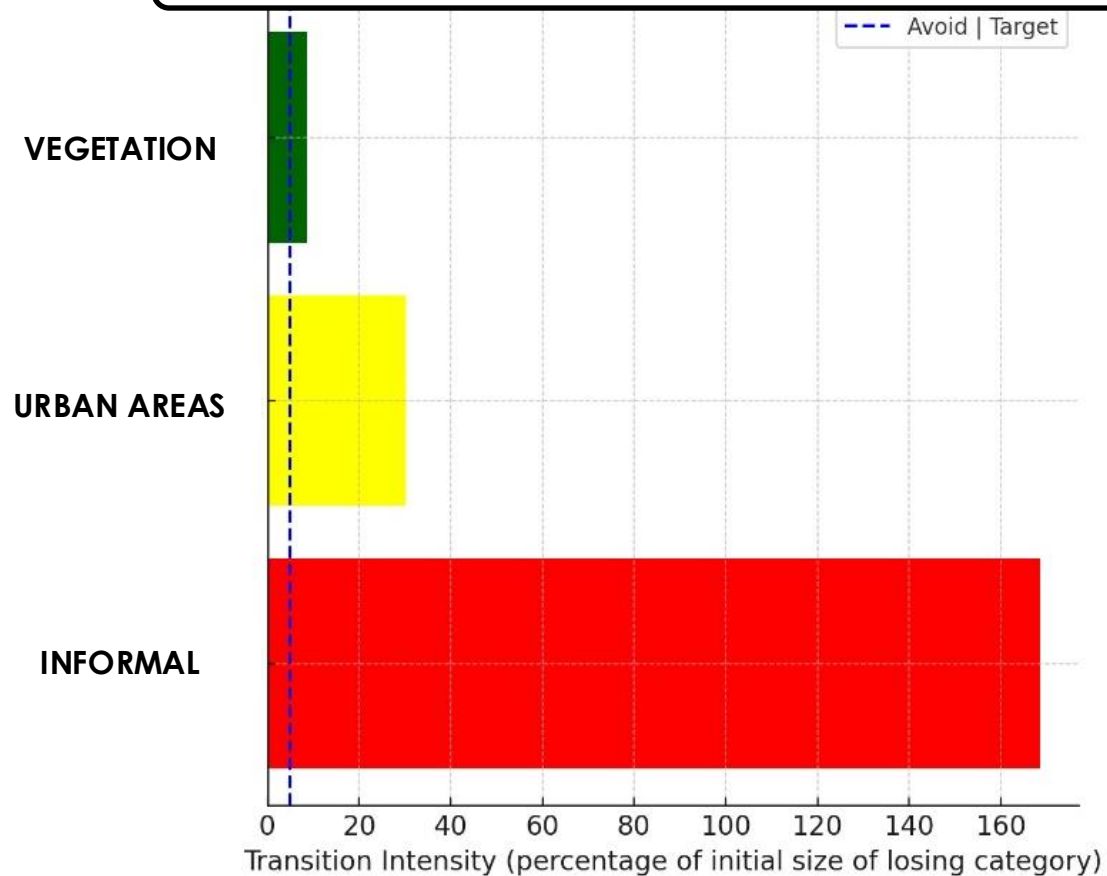
TRANSITION INTENSITY GIVEN THE GAIN OF INFORMAL SETTLEMENTS



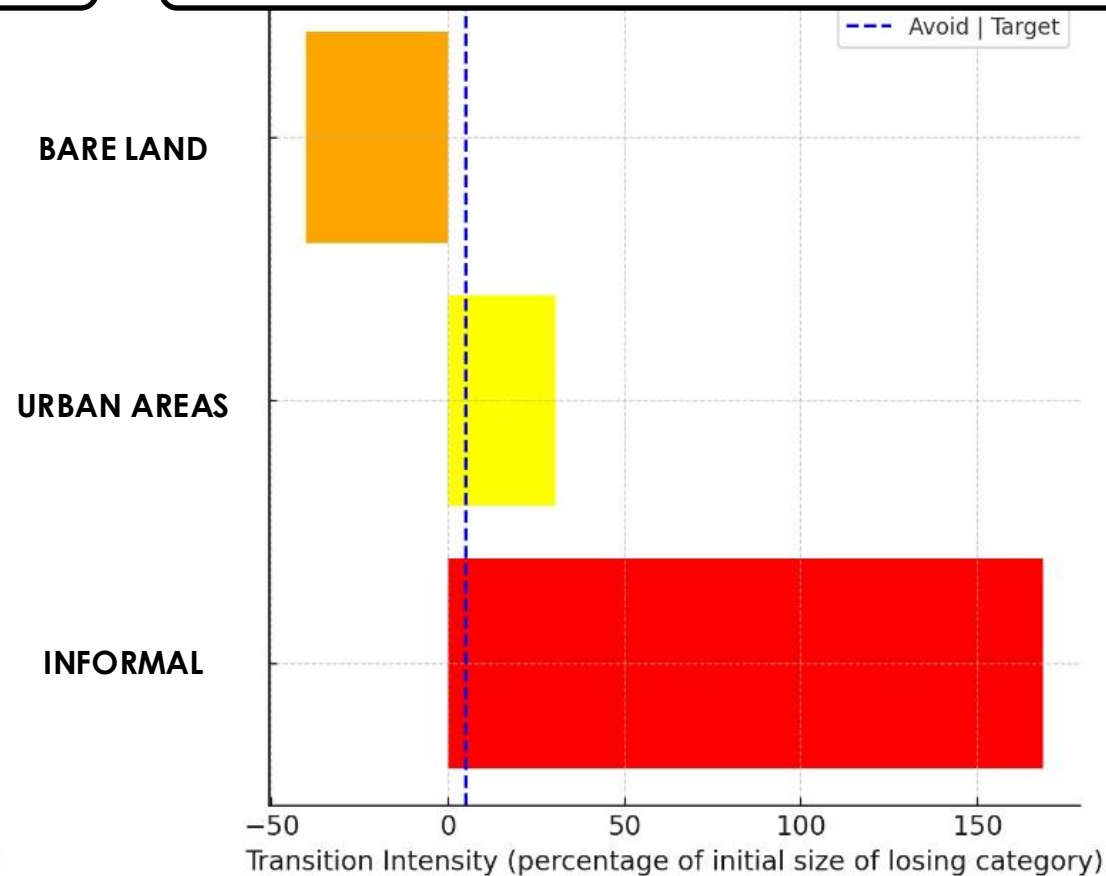
TRANSITION INTENSITY GIVEN THE GAIN OF URBAN AREAS



TRANSITION INTENSITY GIVEN THE GAIN OF BARE LAND



TRANSITION INTENSITY GIVEN THE GAIN OF VEGETATION



ORDINANCES

Year	Ordinance	Description
2010	Metropolitan Ordinance No. 333 (repealed in 2015)	Social responsibility regulation promoting sustainable development in Quito.
2015	Metropolitan Ordinance No. 055	Procedure for special expropriation, allocation of land, and regularization of informal human settlements in urban and expanding urban areas.
2015	Metropolitan Ordinance No. 084	Replaces the 2010 ordinance, promoting Quito as a sustainable and responsible territory.
2016	Metropolitan Ordinance No. 099	Reforms Ordinance No. 055 of 2015, adjusting procedures for expropriation and regularization of social interest settlements.
2017	Metropolitan Ordinance No. 147	Regularization of informal and consolidated human settlements, ensuring the right to adequate housing.
2021	Metropolitan Ordinance No. 001	Update of the Municipal Code on environmental matters, including waste management and conservation.
2023	Ordinance on the protection of rights and social inclusion of homeless people	Establishes a legal framework for the protection and social inclusion of people living on the streets.
2023	Ordinance on the Green-Blue Infrastructure System	Preservation of green spaces and water bodies to improve environmental management and reduce disaster risks.

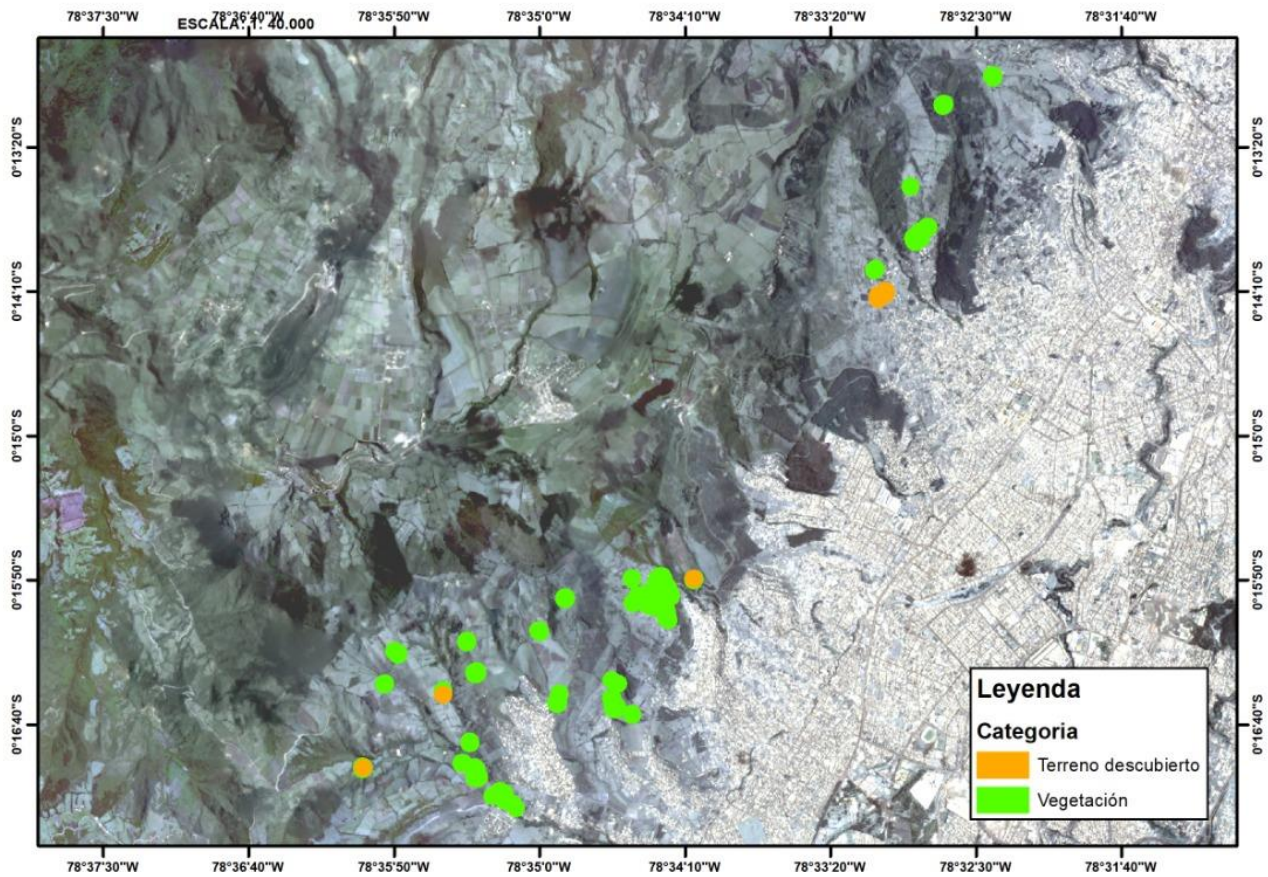


POLICIES

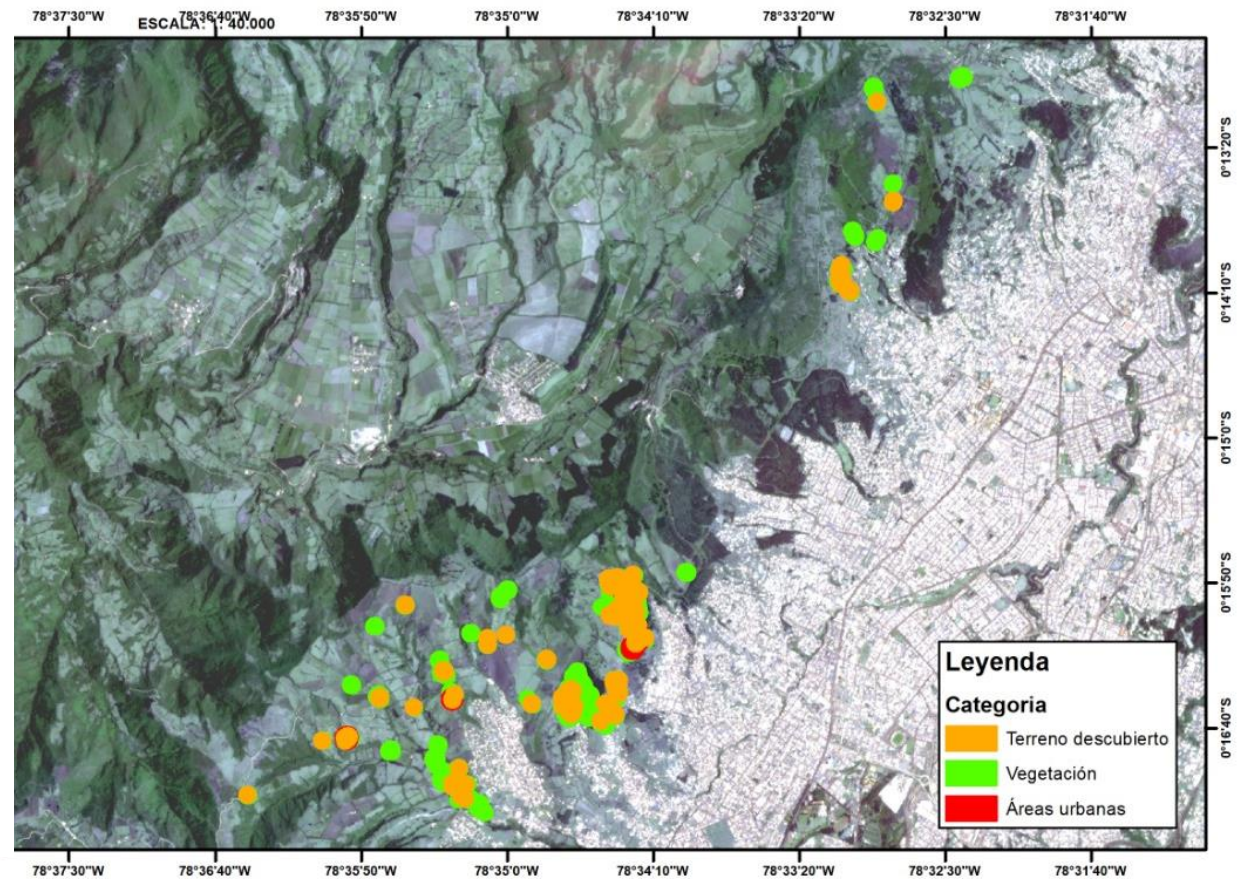
Year	Policy	Description
2010-2023	Regularization Programs for Informal Settlements	Integrate informal settlements into the formal urban framework by providing land tenure, infrastructure, and access to services.
2016	Eco-Efficiency Policy	Encourages sustainable building designs near public transport hubs by offering incentives like additional building height in exchange for eco-friendly construction.
2020	Quito Climate Action Plan (PACQ)	Aims for GHG neutrality and climate resilience by 2050 through Nature-Based Solutions (NBS), urban tree planting, stream management, and resilient public spaces.

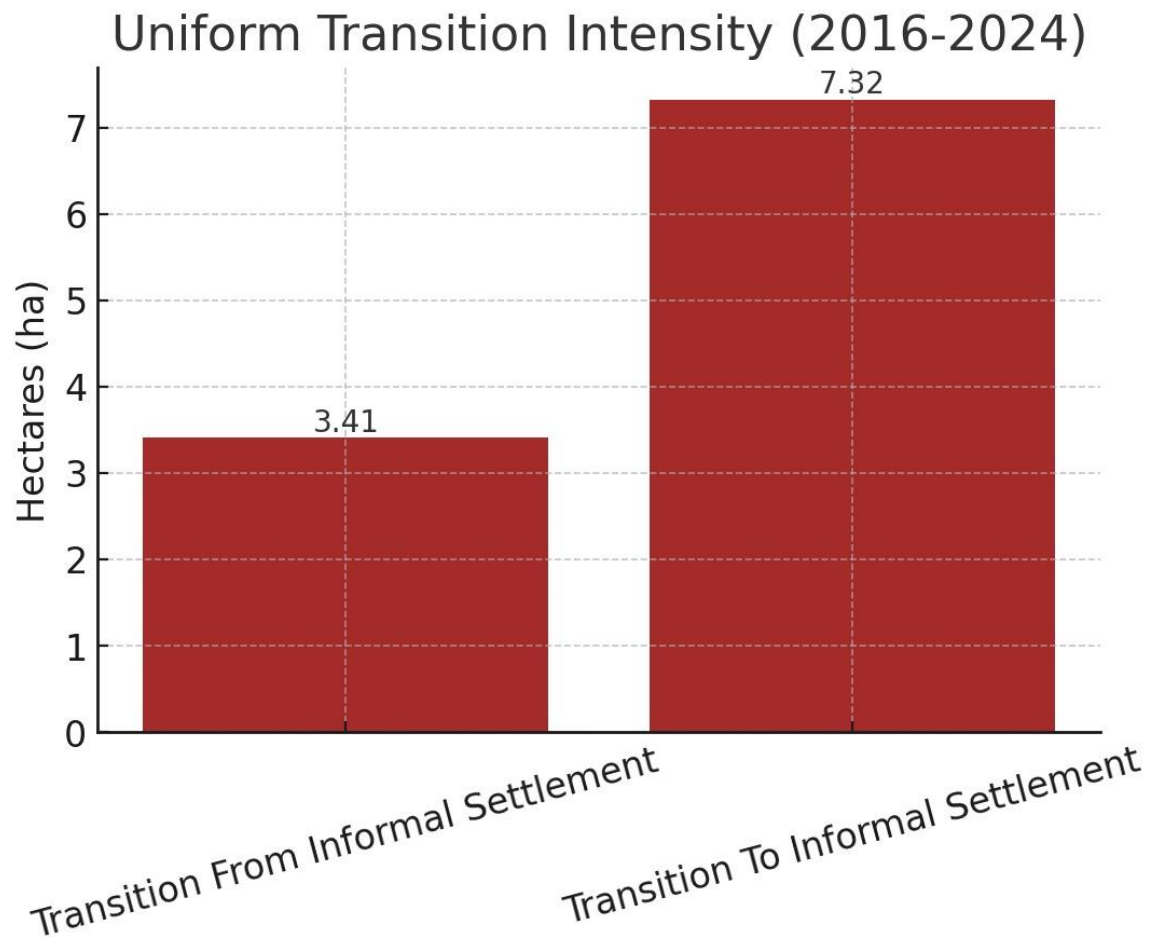


Transition From Informal Settlement



Transition To Informal Settlement





Expansion of Informal Settlements:

7.32 hectares from other categories (e.g., urban areas, vegetation, or vacant land) were converted into informal settlements during the analyzed period.

This indicates a net growth of informal settlements, potentially linked to informal urbanization, population increase, or lack of land regulations

Reduction of Informal Settlements:

3.41 hectares of informal settlements were transformed into another land use category.

Unlike the previous analysis, where no reduction was detected, this new dataset suggests that some informal settlements were indeed relocated or converted into other land uses (e.g., formal urbanization, vegetation regeneration, among others).

CONCLUSIONS



Thank you!



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