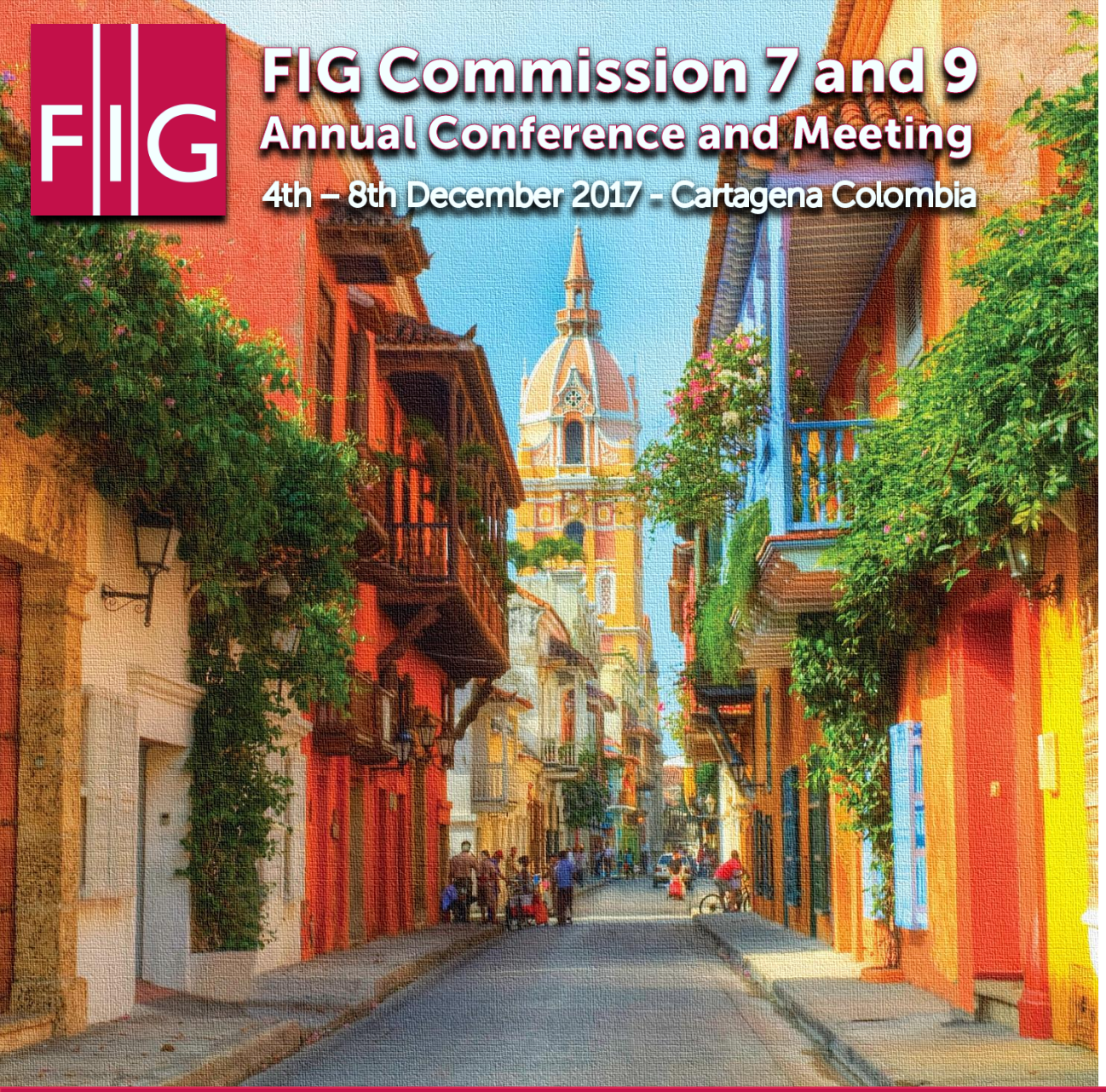

Methodological proposal for inclusion of public green space as a function in land use cover change models.

Case of study - Bogotá D.C. and ten bordering municipalities

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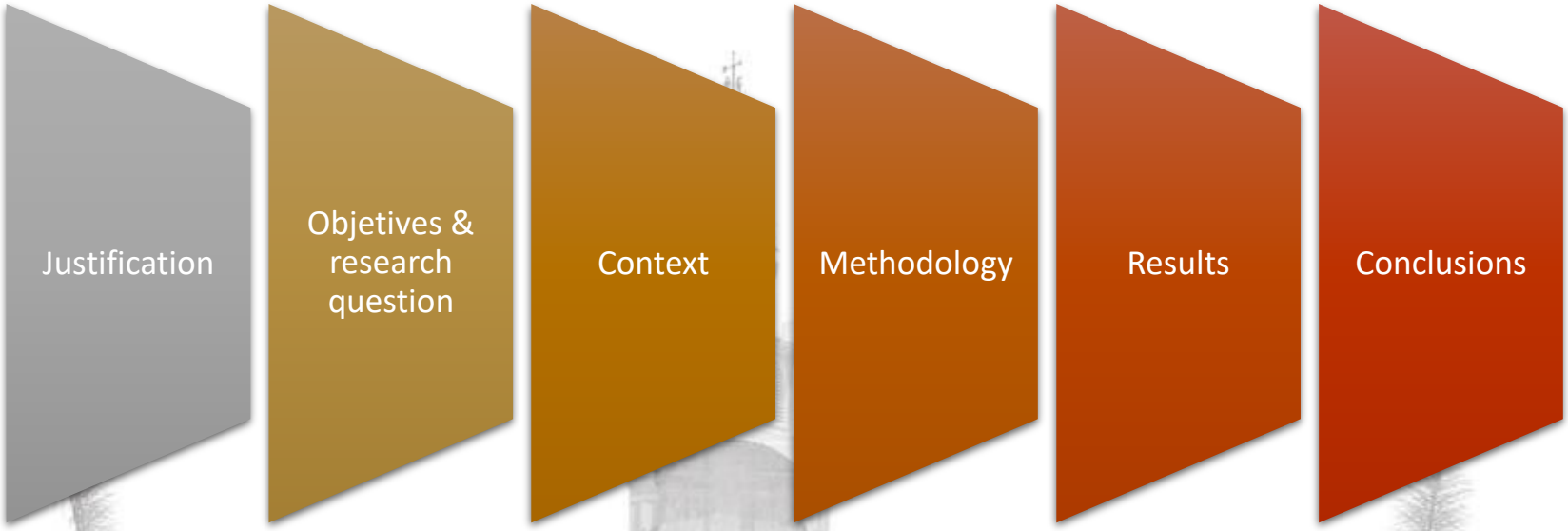
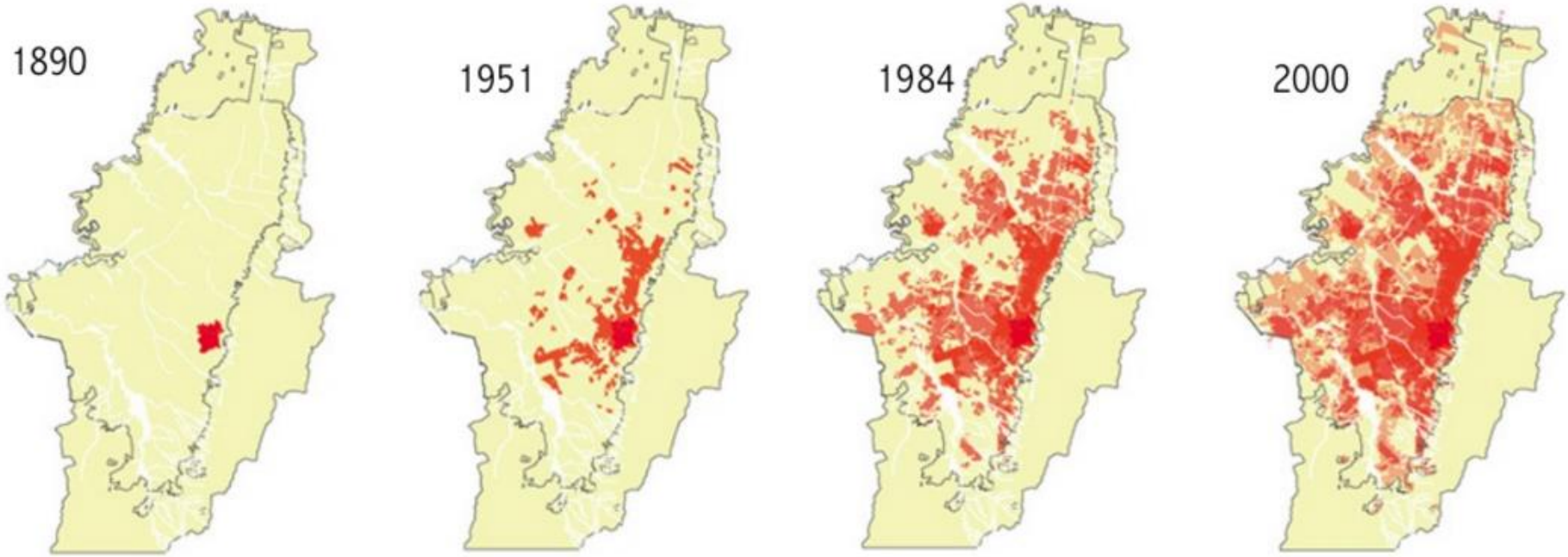
Content


Justification
Objetives & research question
Context
Methodology
Results
Conclusions

Justification



Area: 892,3 Ha
Density: 134 hab/ ha

Area: 35000 Ha
Density: 306 hab/ ha

(Alfonso, 2009)

Objectives

Research question: *How the green space it's distributed in Bogotá?*

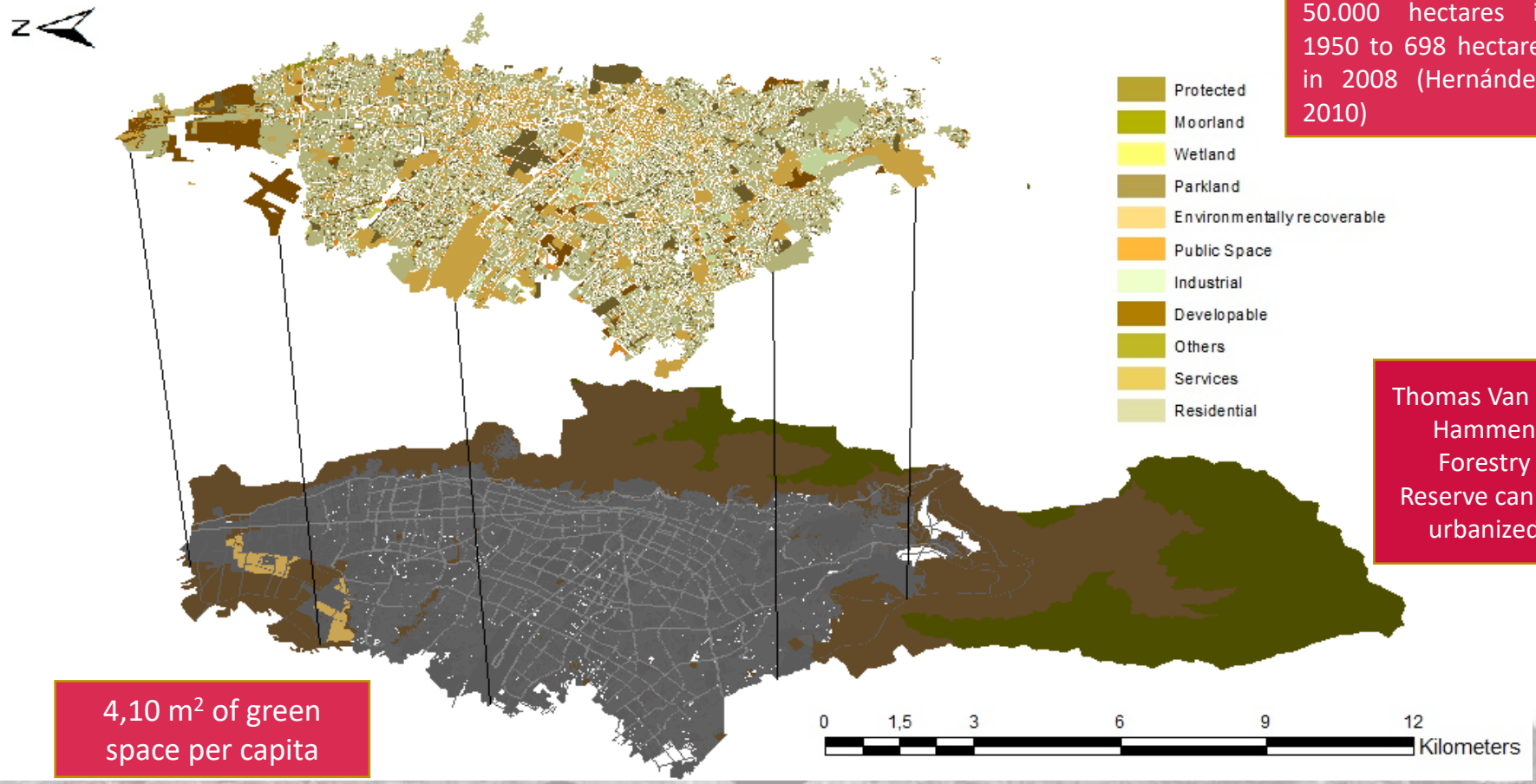
which variables allow to measure it?

How could we forecast green space to achieve the 10 m2 per inhabitant suggested by the WHO?

- Identify the spatial distribution of Green Space Bogotá
- Generate a model to evaluate the variables that correlate with Green Space
- Establish a spatial methodology for predict Green Space
- Elaborate a scenario to predict the Green Space

Context

99% of the original wetlands have dissapeared. From 50.000 hectares in 1950 to 698 hectares in 2008 (Hernández, 2010)

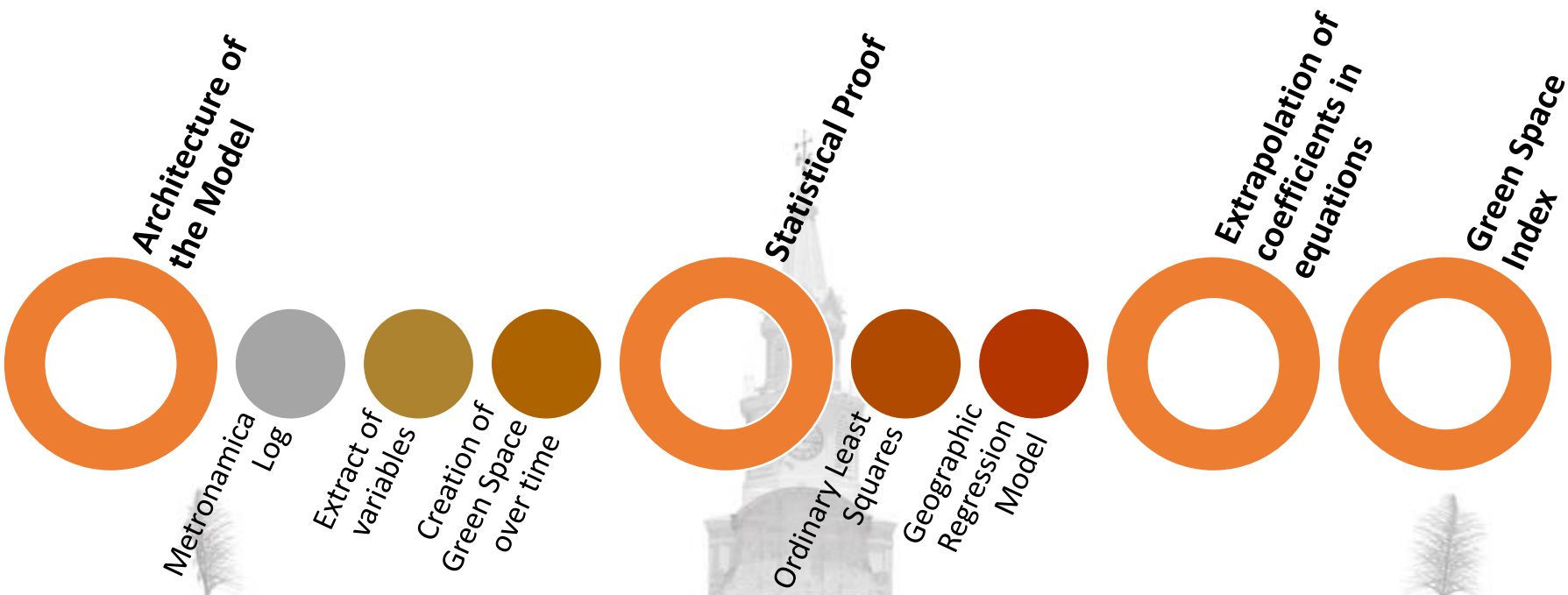


Thomas Van Der Hammen Forestry Reserve can be urbanized

4,10 m^2 of green space per capita

(IPCC, 2007) (Bocarejo, Portilla, & Pardo, 2013) (Alfonso, 2009) (Scopellieti, et al., 2016)

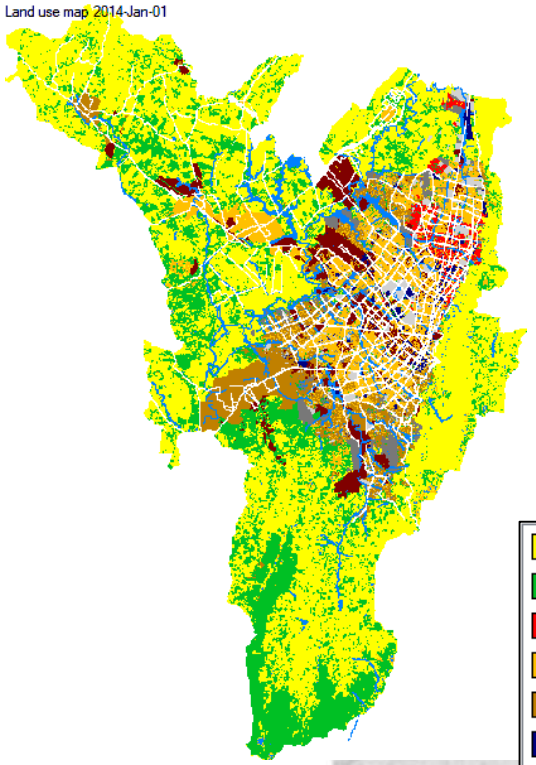
Methodology



Software…"Metronamica"

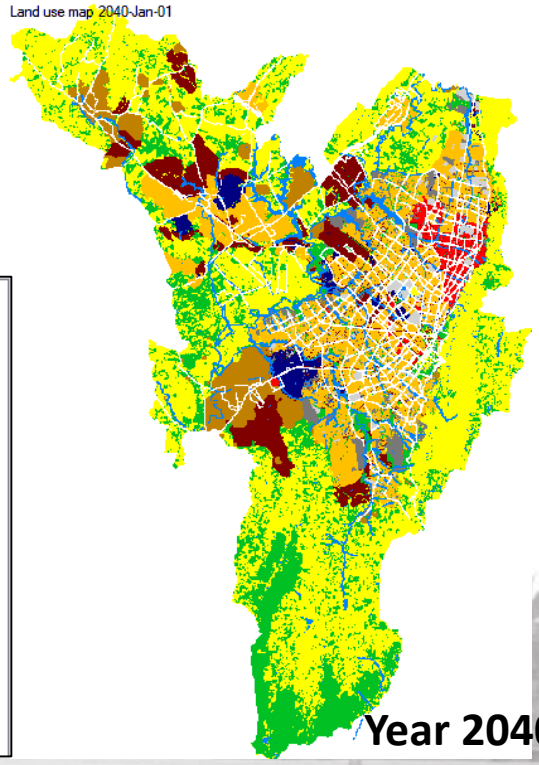
- Land Use
- Zoning
- Suitability
- Accessibility
- Stochastic

=



Year 2014

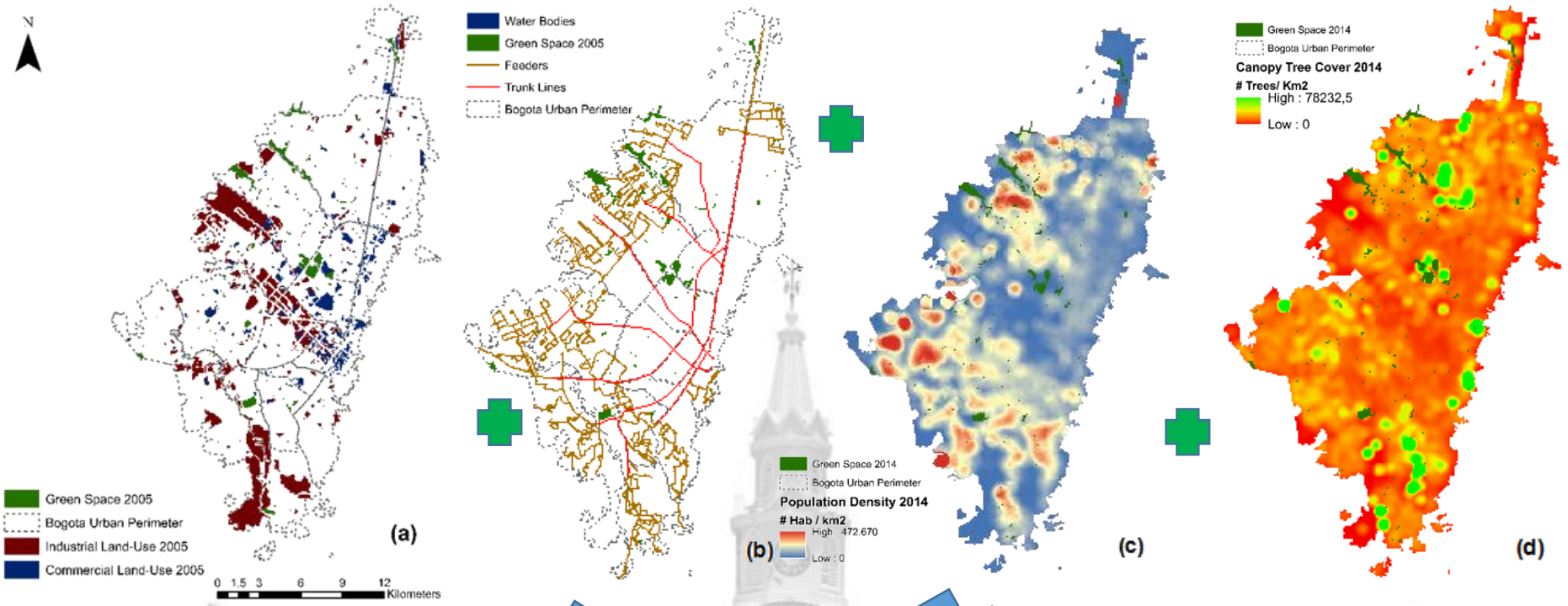
- Demand Estimation
- Calibration
- Scenarios Evaluation
- Results



Year 2040

- Disponible
- Zona Agrícola
- Residencial Alto
- Residencial Medio
- Residencial Bajo
- Comercial
- Industrial
- Otros
- Equipamientos
- Vias
- Cuerpos de Agua
- Humedales

Architecture of the model to measure Green space



$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n + \varepsilon$$

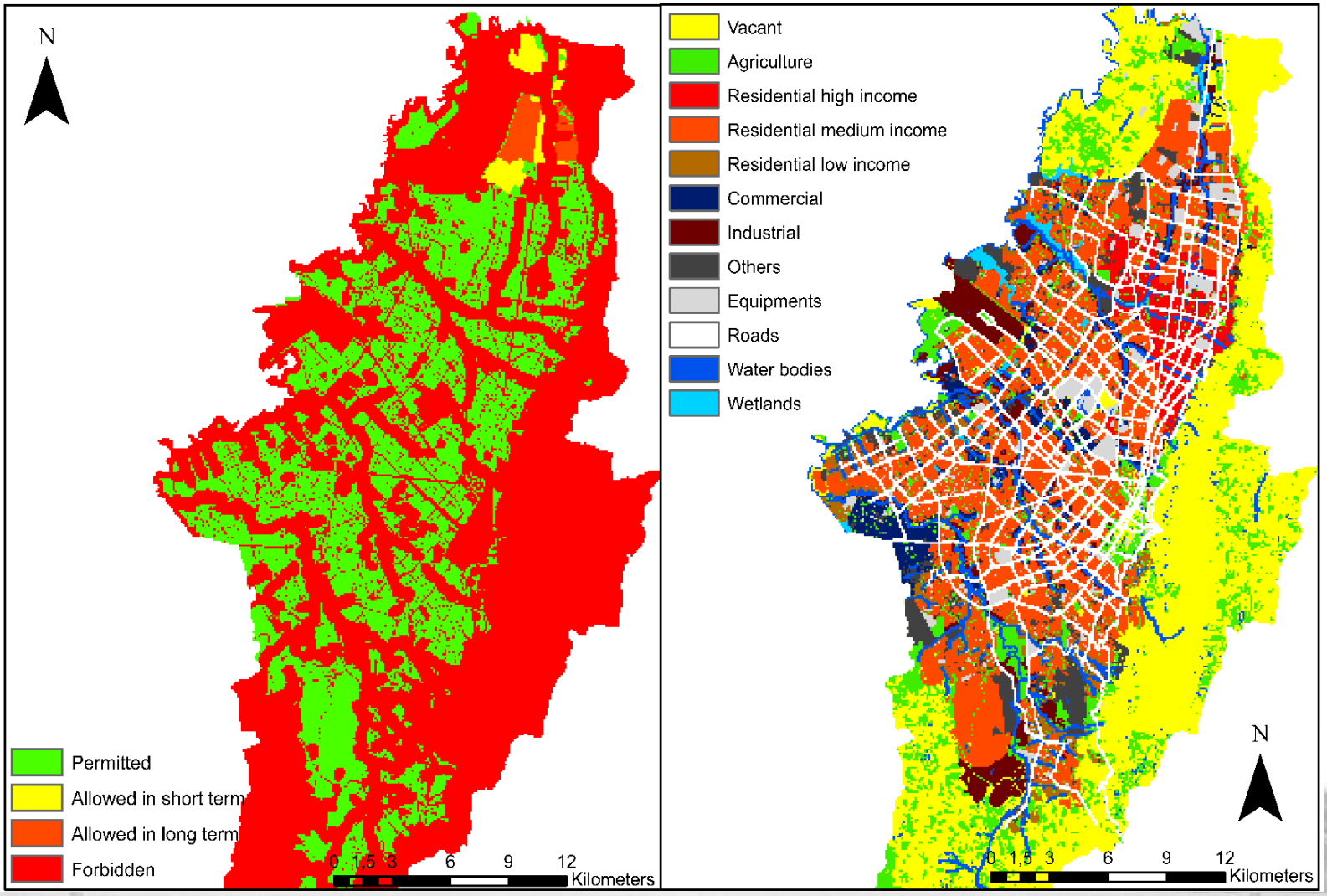
Equation 1. OLS regression model representation

$$y_i = \beta_0(u_0 v_0) + X_I^T \beta_I(u_I v_I) + \varepsilon \; for \; i = 1, 2, 3, \ldots, N$$

Equation 2. GWR regression model representation

green space per capita index

Just following the law...2040 a greener city



Changing conditions...2040 the ideal scenario

	Year 2040				
Variable	Coefficient	StdError	t-Statistics	Probability *(P-Value)*	Variance Inflation Factor (VIF)
Intercept	34,1552	7,8534	2,6082	0,0092*	----
Population density	-0,0005	0,0001	-3,1001	0,0019*	1,0559
Water bodies network density	6,9905	2,3383	2,4536	0,0143*	1,0006
Public transport network coverage	1,0146	0,7896	-2,0854	0,0172*	1,0742
Industrial area distance	-0,0140	0,0046	-2,6420	0,0083*	1,0389

Table 4. Estimate OLS results for the representative variables for 2040

Year	**2040**	
Statistic	Value	Criteria
Multiple R-Squared	0,028	
Join F- Statistic	8,141	Prob(>F), (4,1140) degrees of freedom: 0,000002*
Joint Wald Statistic	12,832	Prob(>chi-squared), (4) degrees of freedom: 0,024362*
Koenker (BP) Statistic	9,579	Prob(>chi-squared), (4) degrees of freedom: 0,0,048156
Jarque-Ver Statistic	4518628,820	Prob(>chi-squared), (2) degrees of freedom: 0,000000*

Table 5. Descriptive statistics for the OLS regression model in 2040

Global relationship of the model

Variable	Value 2005	Value 2014	Value 2040
Number of Observations	1067	2423	1145
ResidualSquares	624080,208	5867983,300	9747857,192
EffectiveNumber	71,090	219,224	146,399
Sigma	25,033	51,601	61,887
AICc	9939,504	26099,742	13854,625
R2	0,297	0,405	0,562
R2Adjusted	0,248	0,347	0,469

Table 6. GWR result for the three periods of time

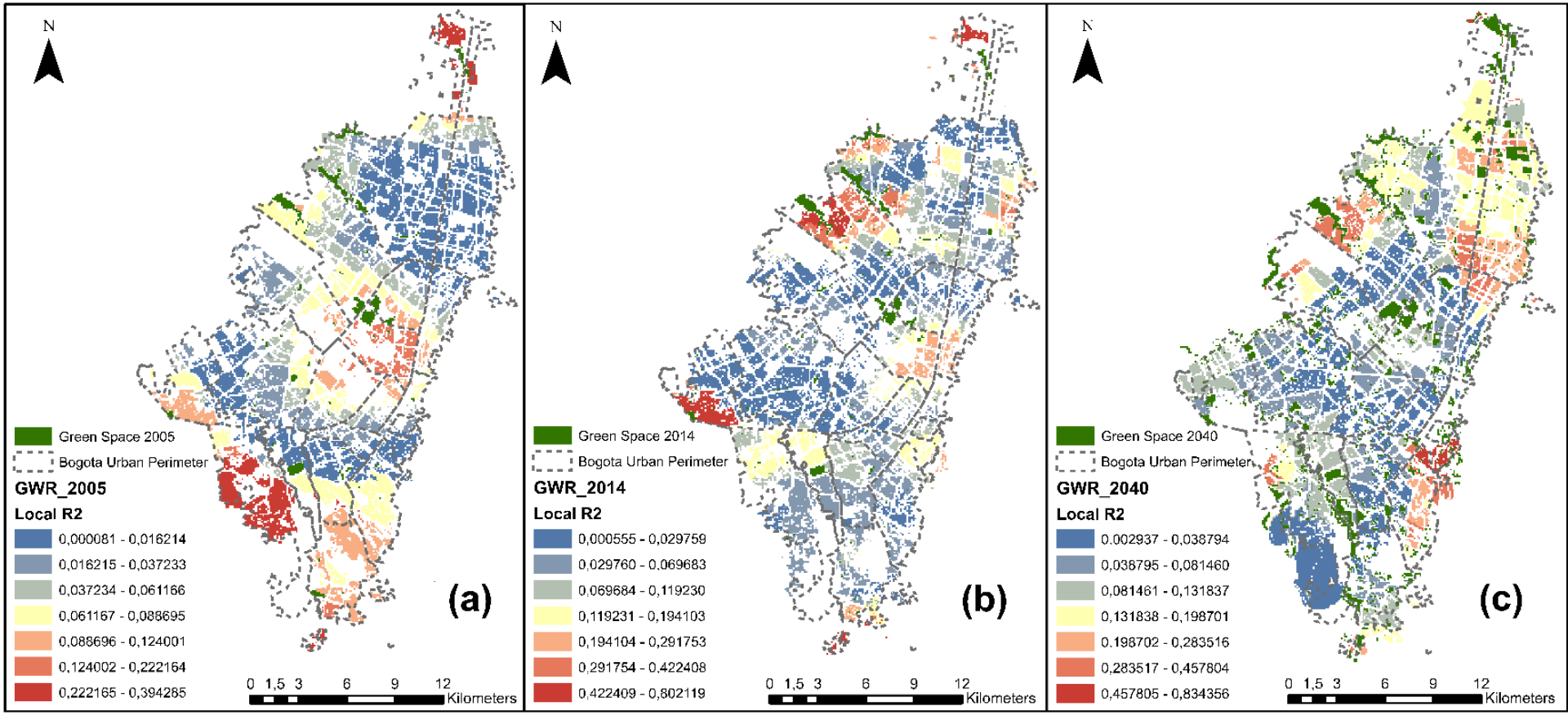


Figure 5. GWR Spatial distribution for the local R2 for the UGGI per Capita the three periods of study

Green Space per cápita Index over time

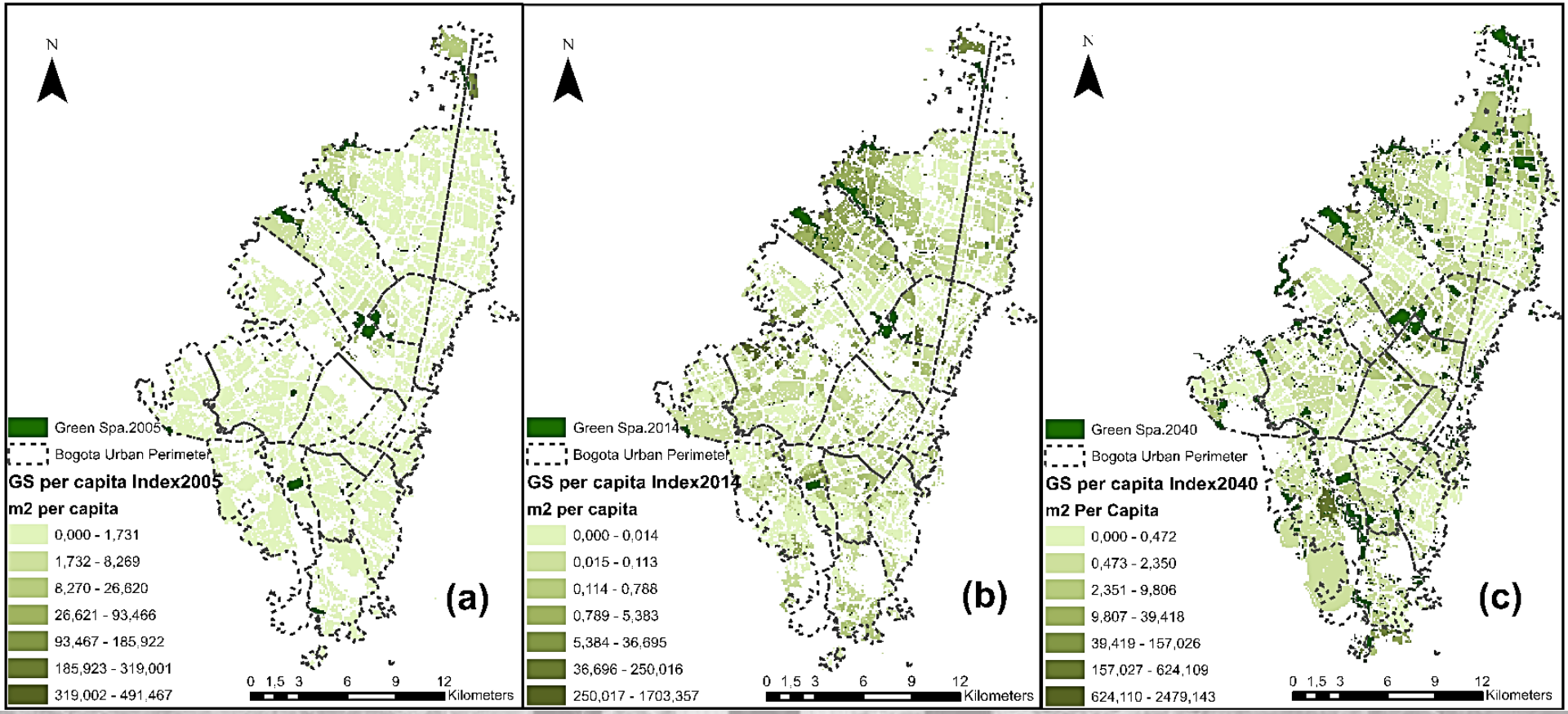
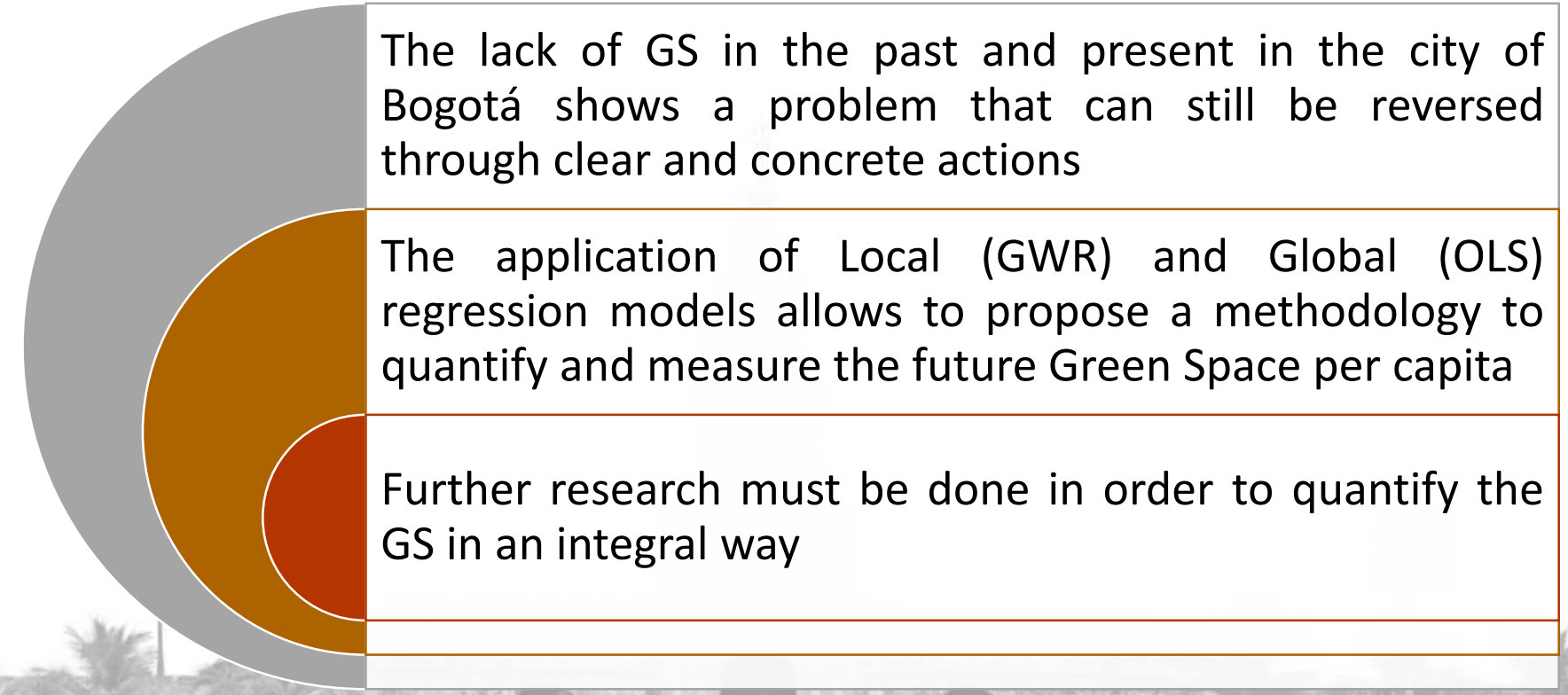


Figure 6 Change in UGS per capita over time

Conclusions



Thank you for your attention

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