

PROYECT 3. URBAN GROWTH AND OPPORTUNITIES FOR
SUSTAINABLE URBAN MOBILITY

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Modelación del “urban sprawl”: Ejemplos de ciudades medias chilenas

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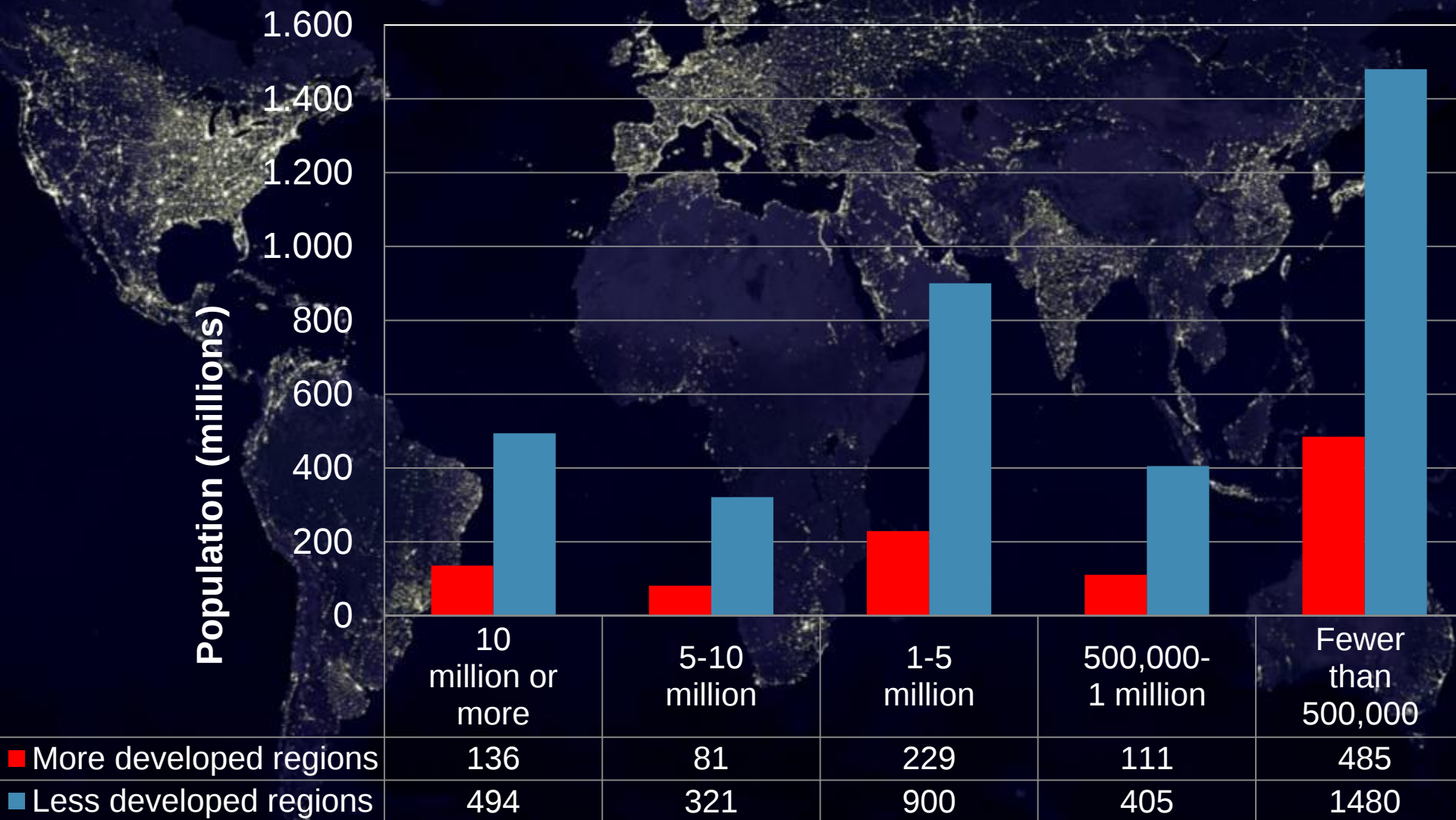
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2. Example 1 Modelling mid-sized cities growth: Chillán and Los Ángeles, Biobío Region
3. Example 2. Land use change modelling applied to natural risk. Antofagasta-Mejillones, II Antofagasta Region
4. Conclusions

Theoretical framework

1. Approach of the **urban ecology**; Breuste et al (2008), Sukopp (1998), Alberti (2003), Niemelä (2011); and **environmental geography** (Castre et al, 2009).
2. How to study urban sustainability?: **urban pattern**, urban flows, and urban quality (Alberti, 1996)
3. How are the spatial patterns of **Latin American cities**?: compact city v/s diffuse city
4. How to model and simulate these patterns?: **geomatics**
 - Remote sensing & fieldworks
 - GIS analysis & modelling
 - Quantitative & qualitative methods

Population distribution of the world and development groups, by size class of urban settlement, 2025



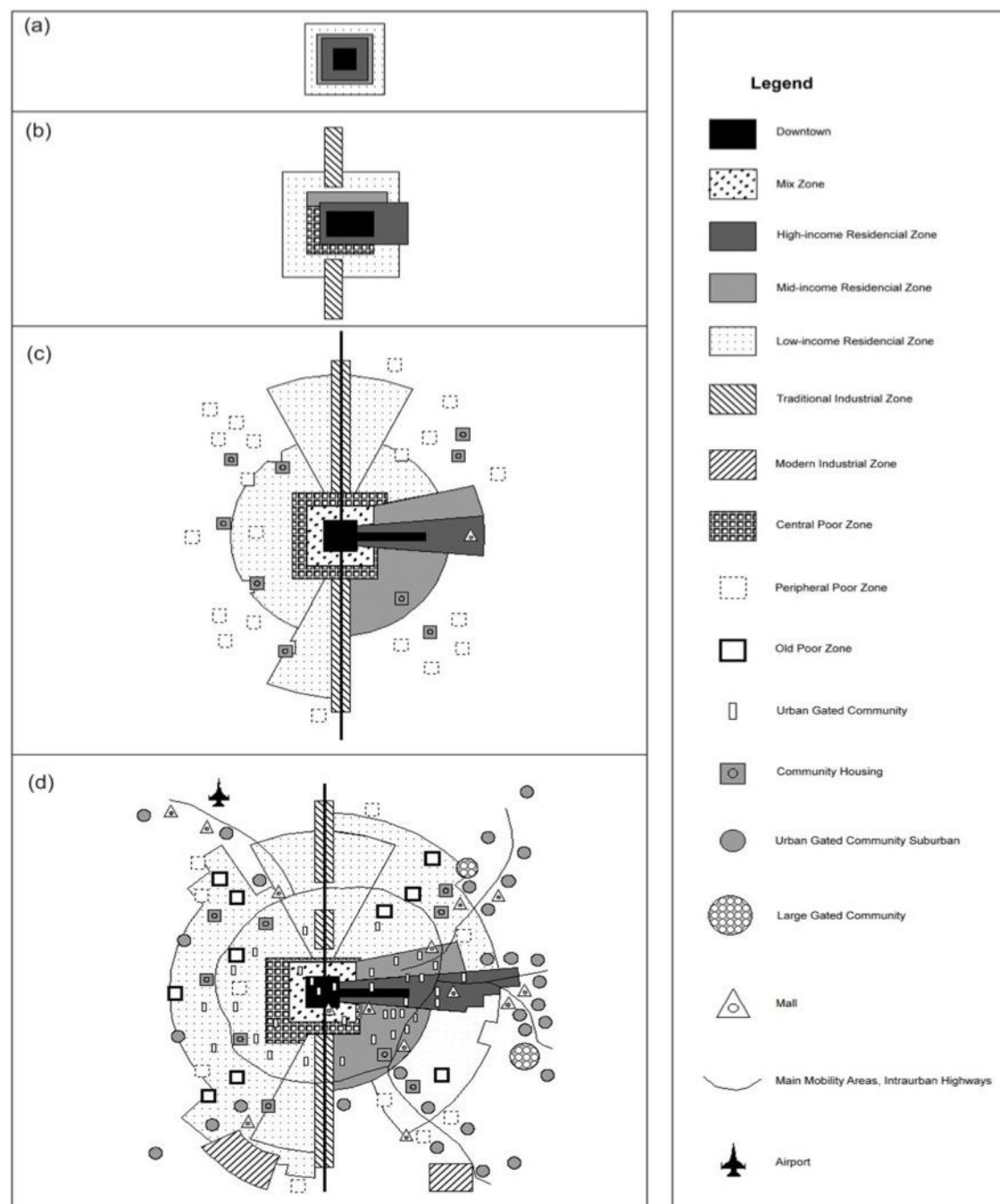
Latin American City model

(a) Colonial City (1550-1820)

(b) City at the end of the 1st stage of urbanization (1820-1920)

(c) City at the end of the 2nd stage of urbanization (1920-1970)

(d) Current City (1970 → today)



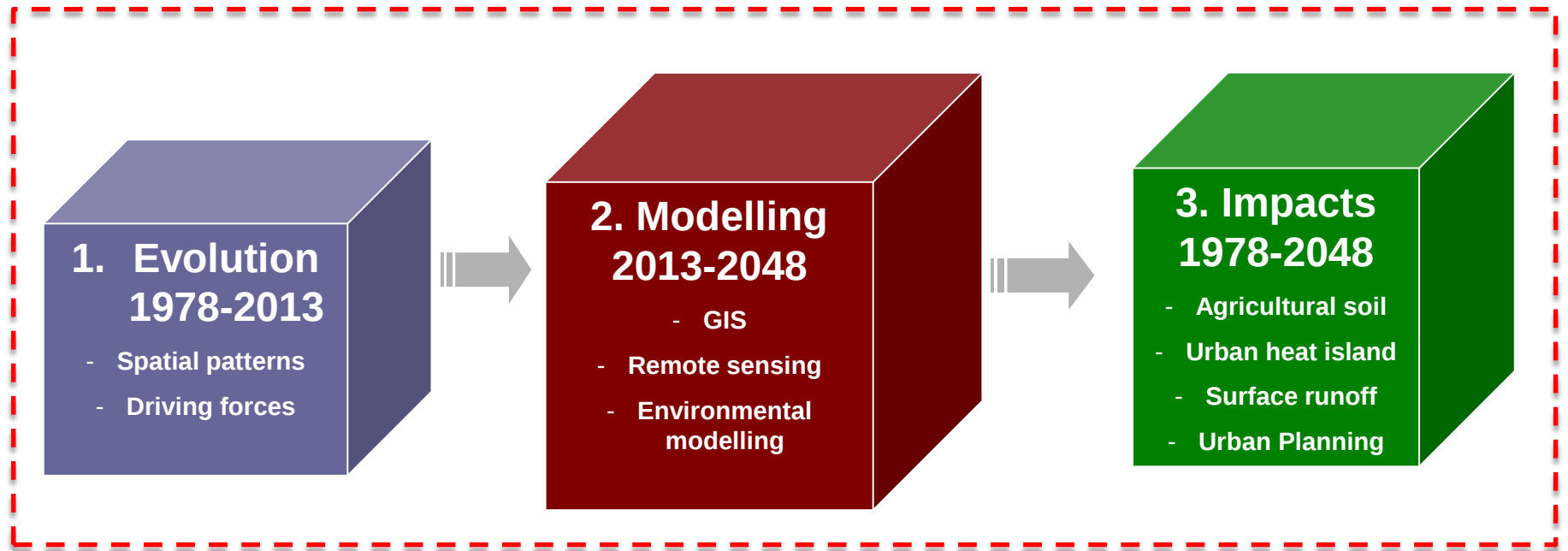


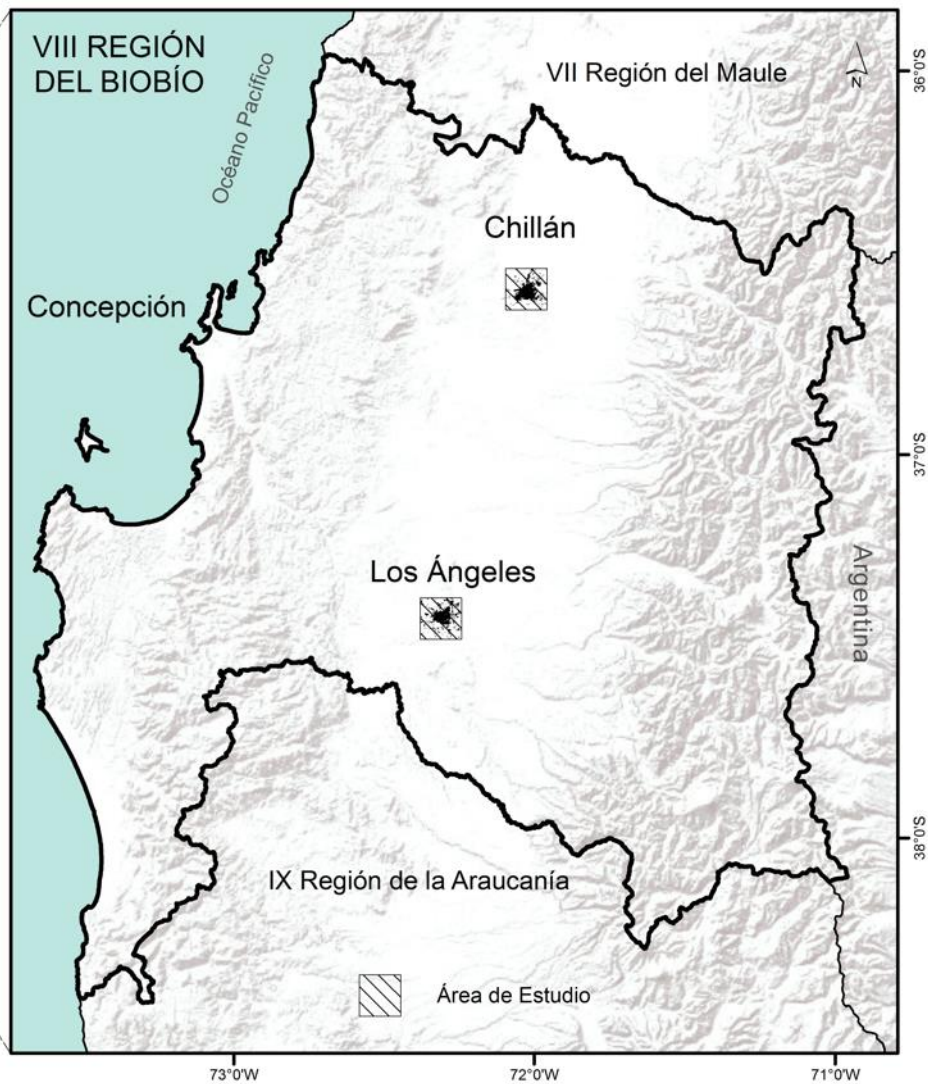
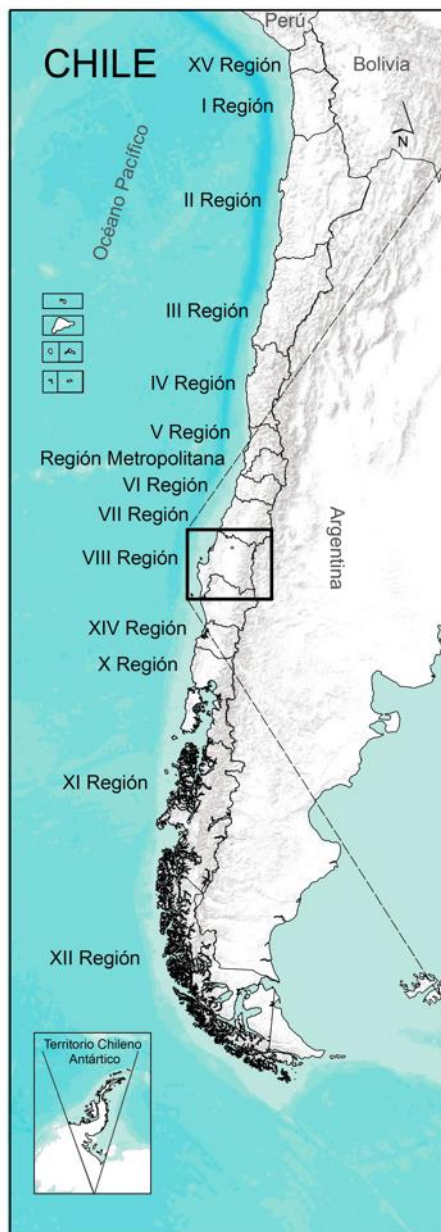
- Fragmented
- Spontaneous
- Random

Example 1

Modelling land use/cover in Chilean mid-sized cities (MSSCUS)

Chillán and Los Ángeles, VIII Biobío Region

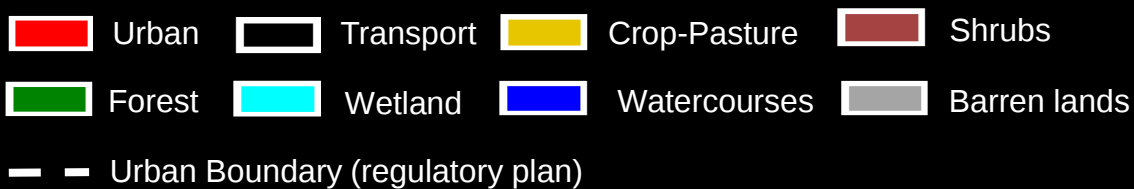
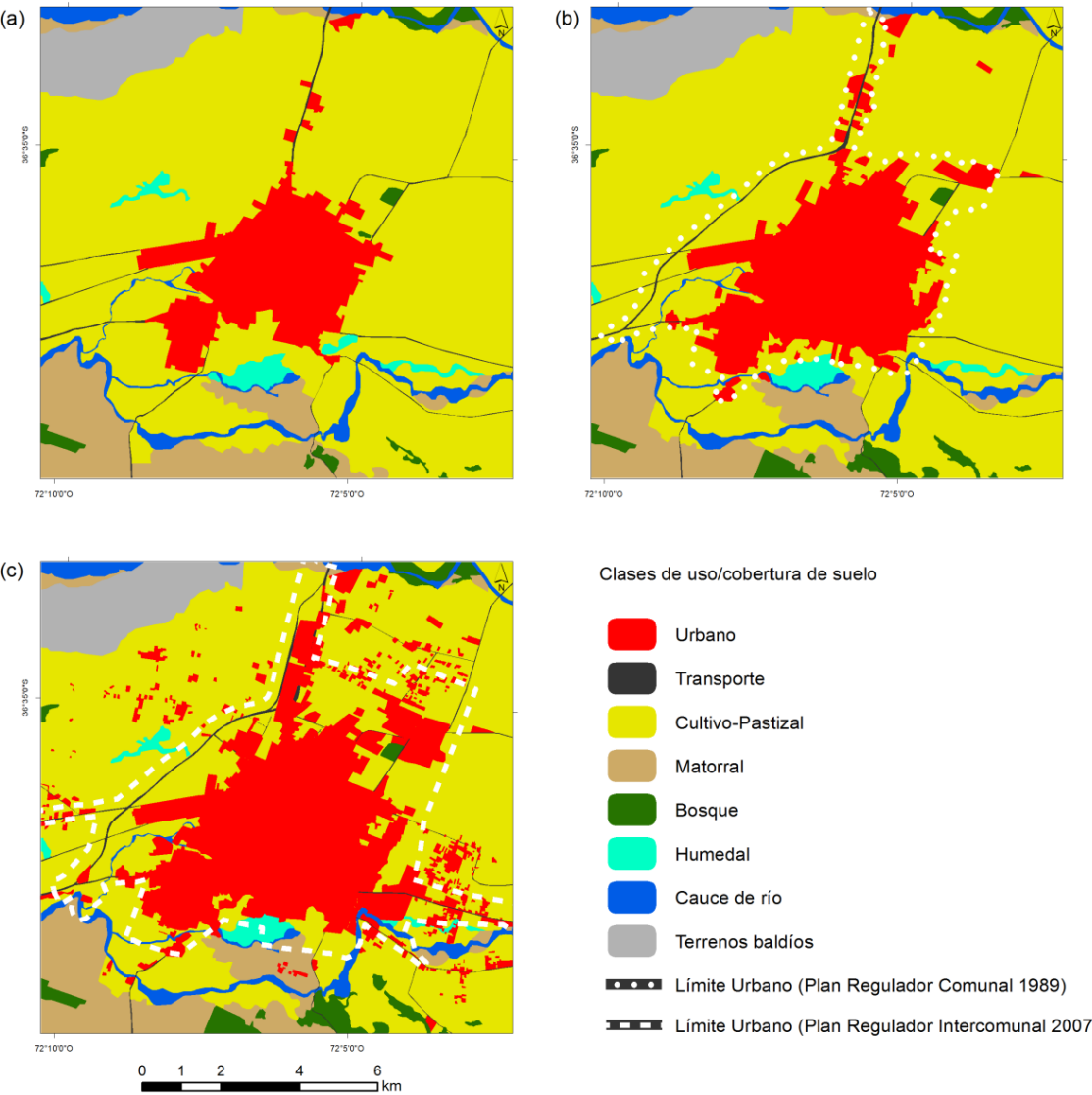




0 20 40 60 80 km

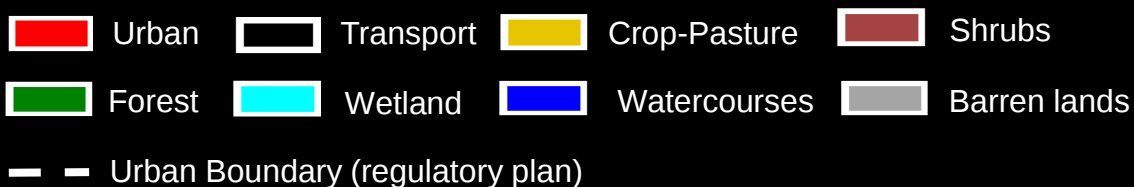
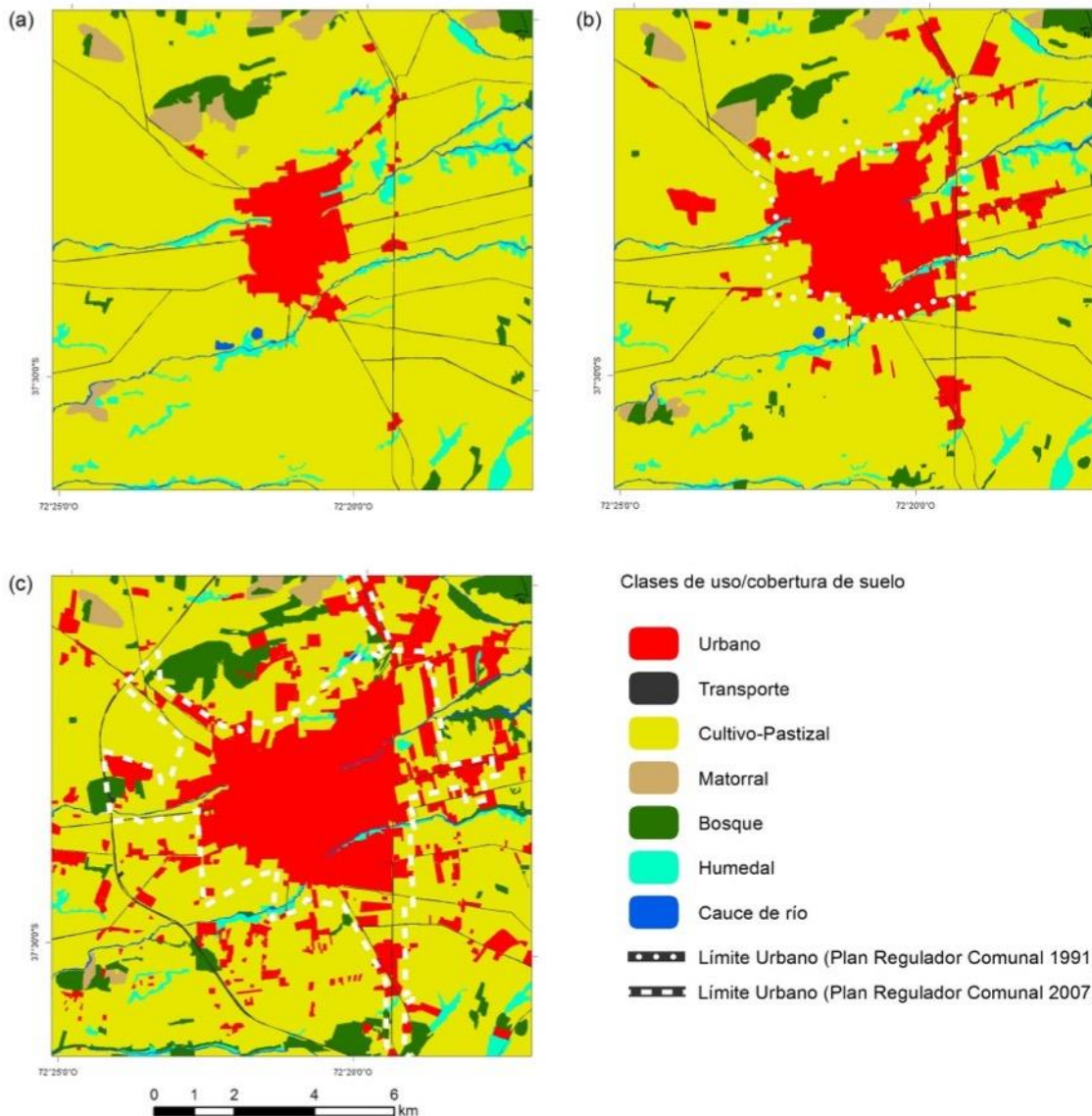
Evolution
1978-2013

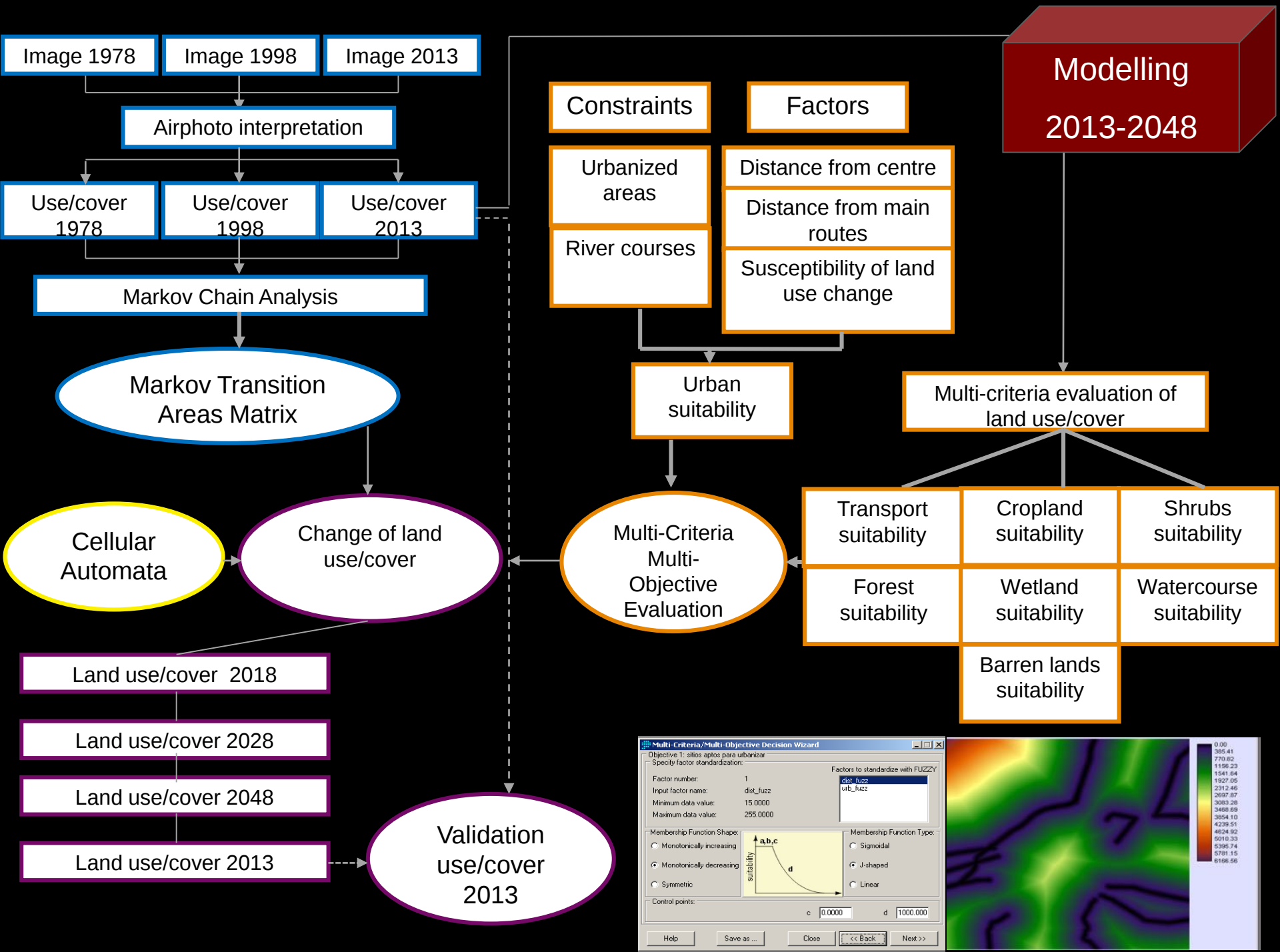
Chillán



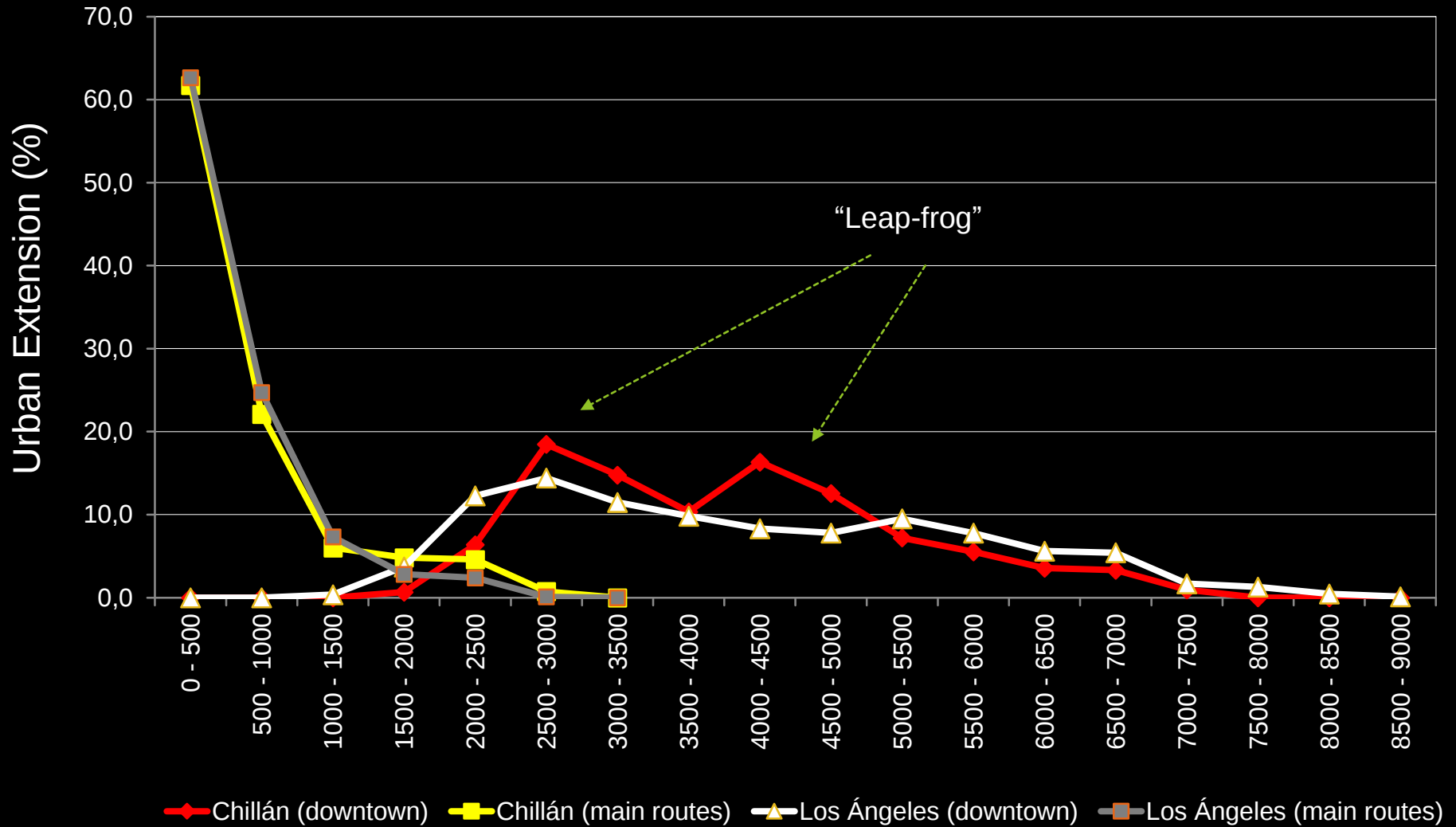
Evolution
1978-2013

Los Ángeles





Description of urban growth patterns

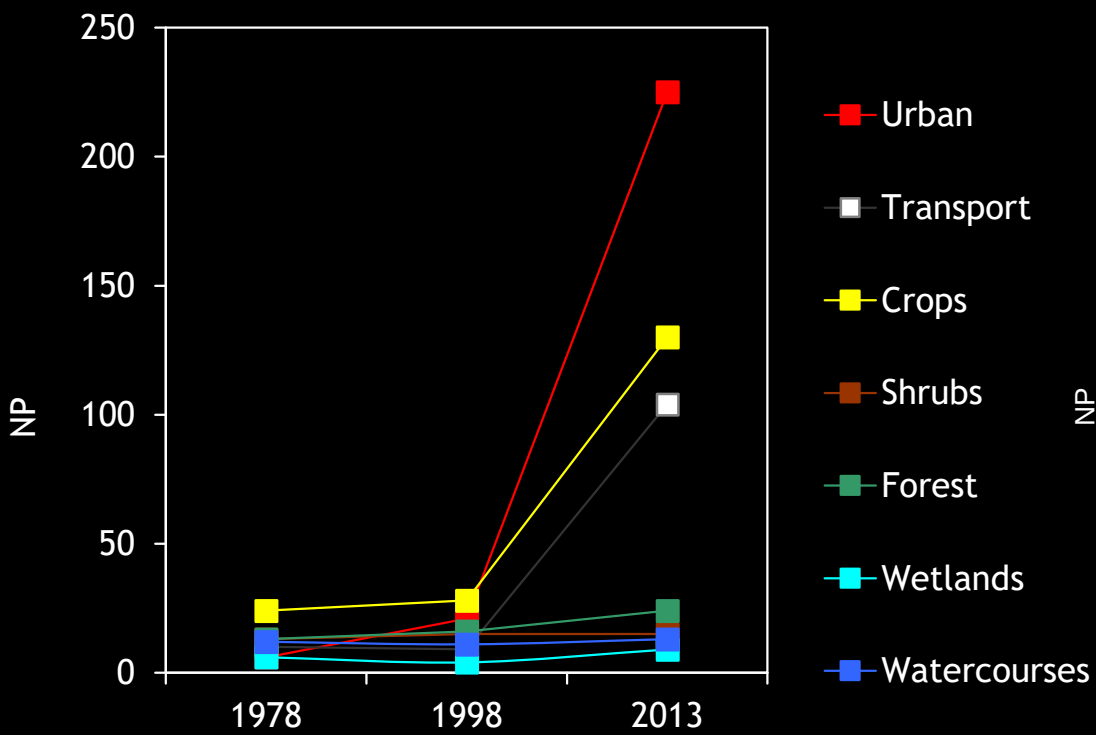


Fragmentation of the physical and social landscape

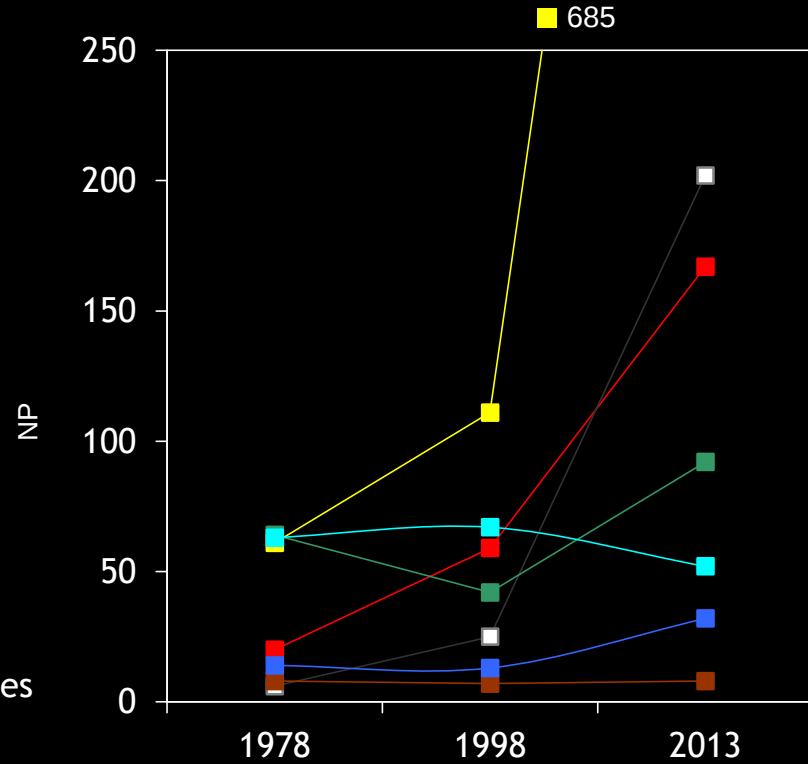
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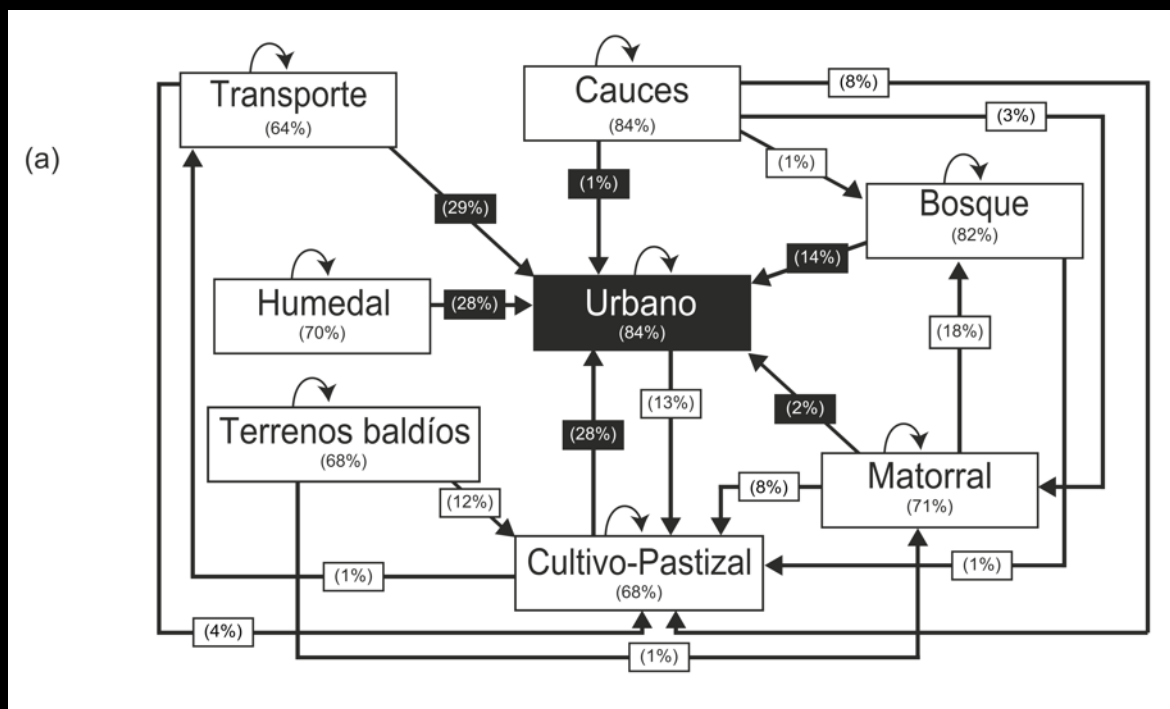
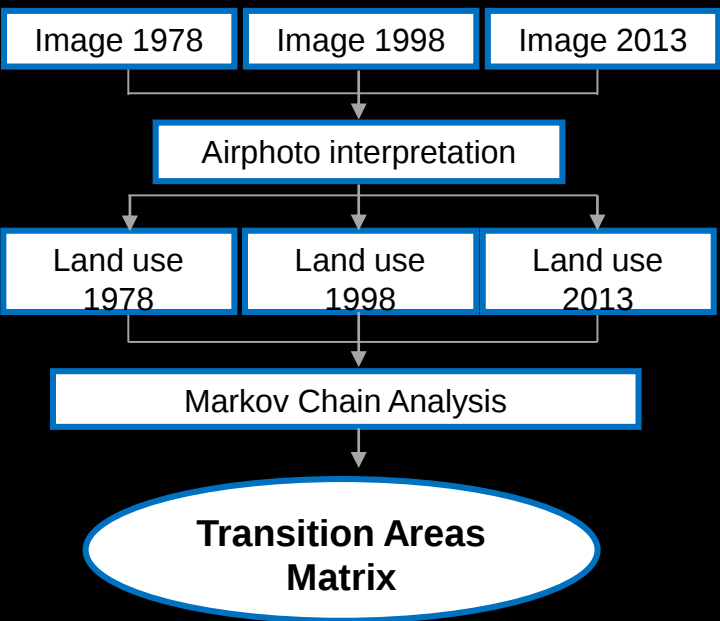
- (a) Number of urban patches (NP)
- (b) Percentage of landscape (PLAND)
- (c) Density of patches (PD)
- (d) Largest patch index (LPI)

Chillán

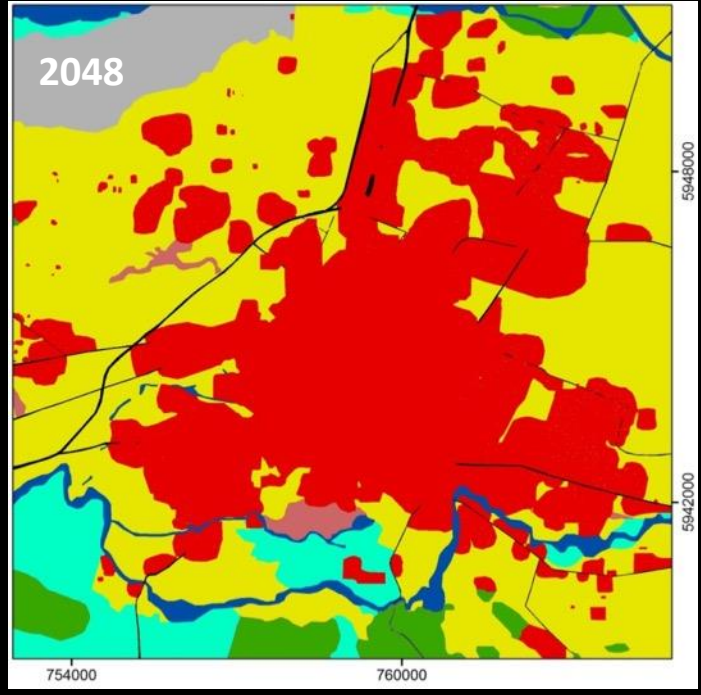
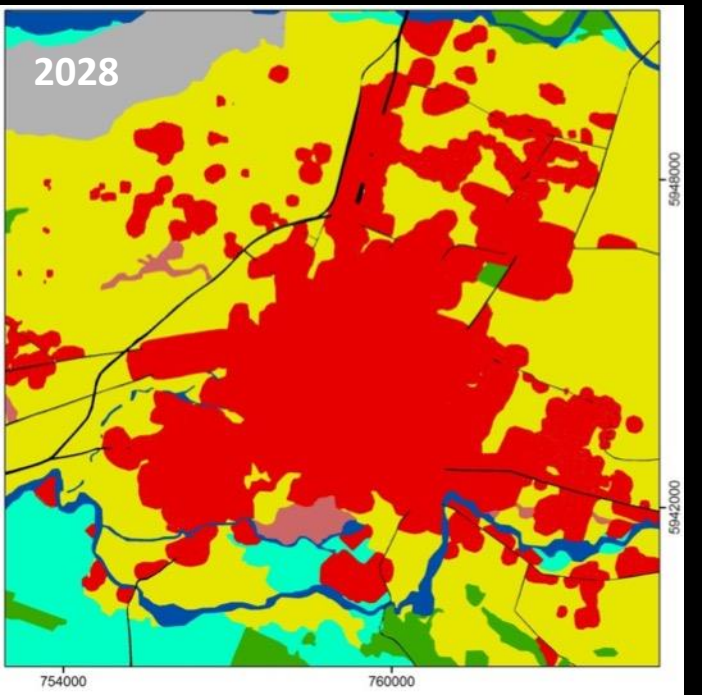
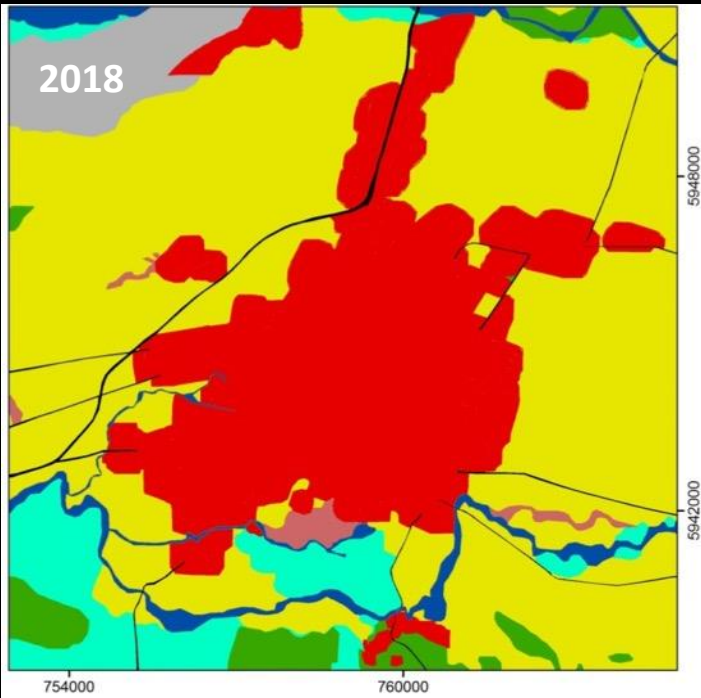
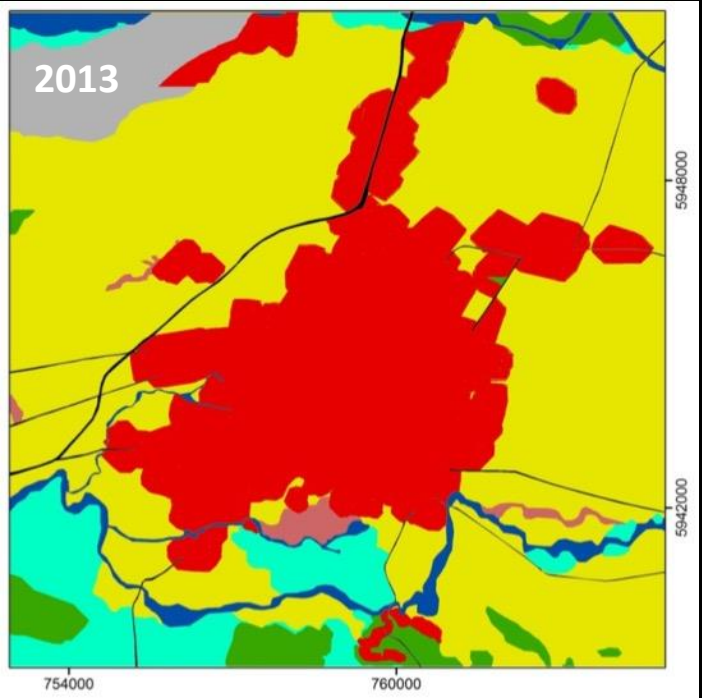


Los Ángeles

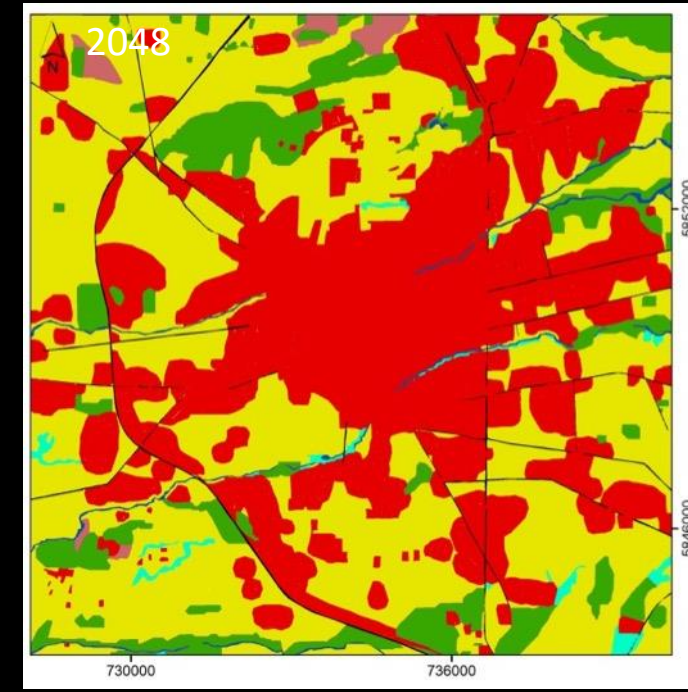
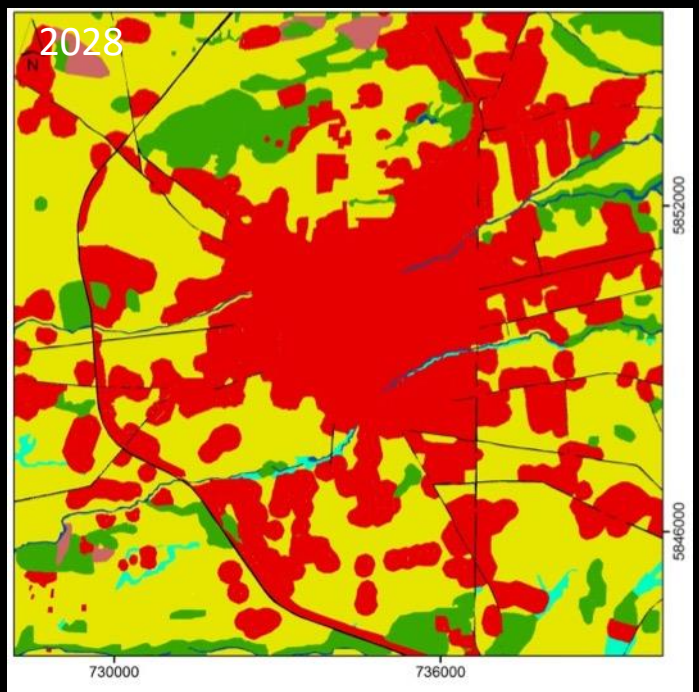
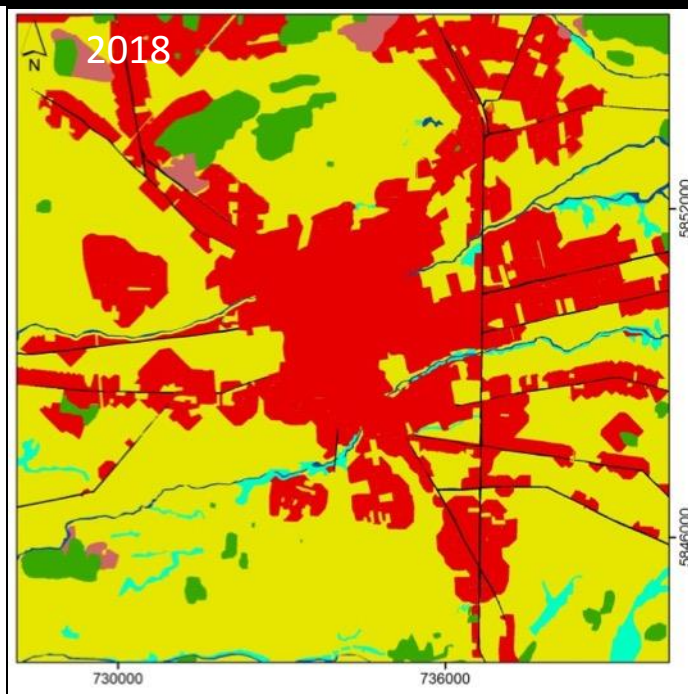
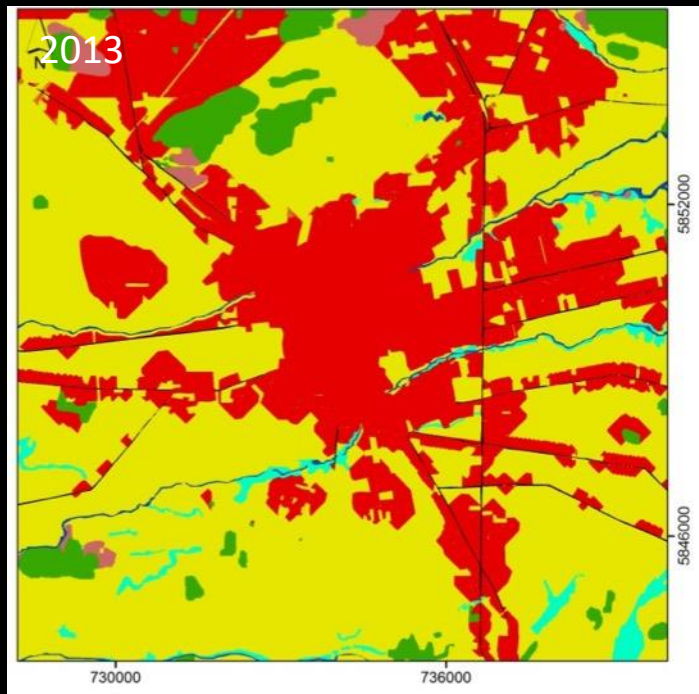




Modelling 2013-2048



Modelling 2013-2048



Validation

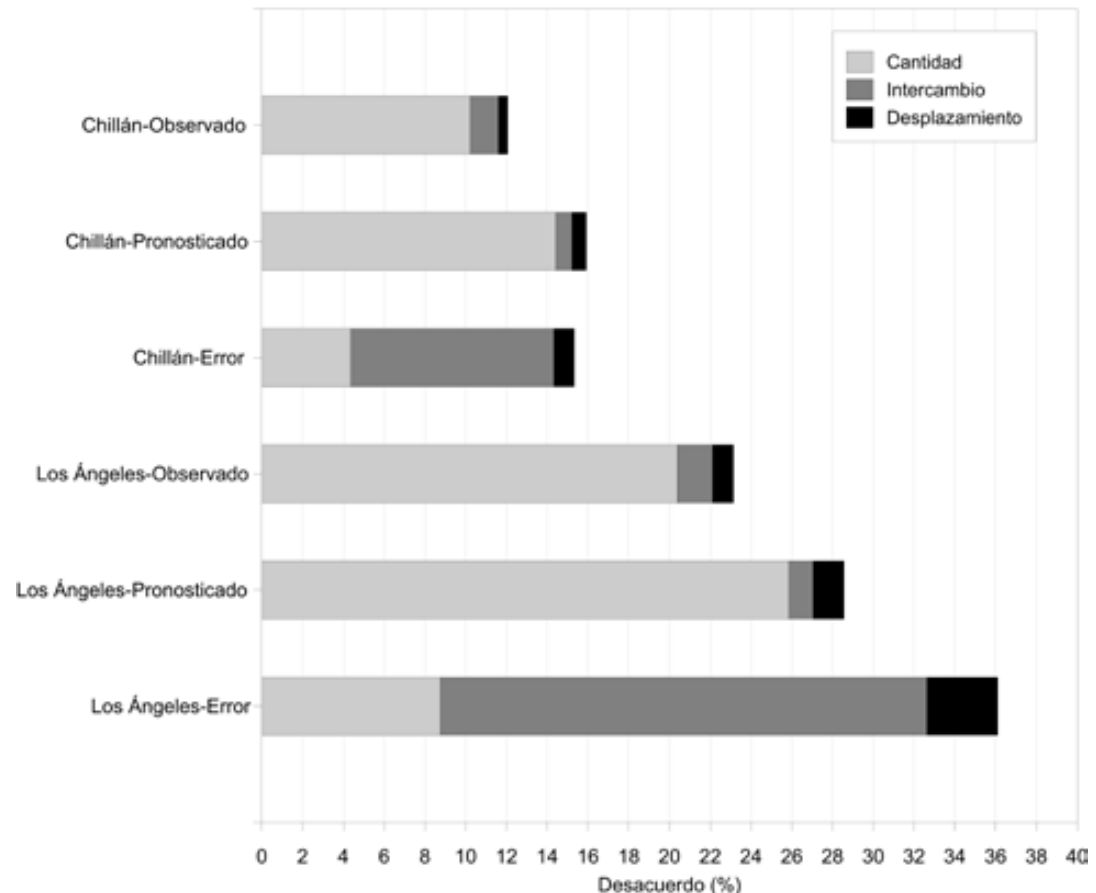
Modelling
2013-2048

Validation between estimated (2013) and observed Image (2013) in both cities

Chillán	(1)
2013 observado (ha)	3.360,6
2013 estimado (ha)	3.840,0
Diferencia (ha)	-479,4
Porcentaje (%)	14,3
Los Ángeles	(1)
2013 observado (ha)	3.464,2
2013 estimado (ha)	4.689,9
Diferencia (ha)	-1.225,7
Porcentaje (%)	35,4

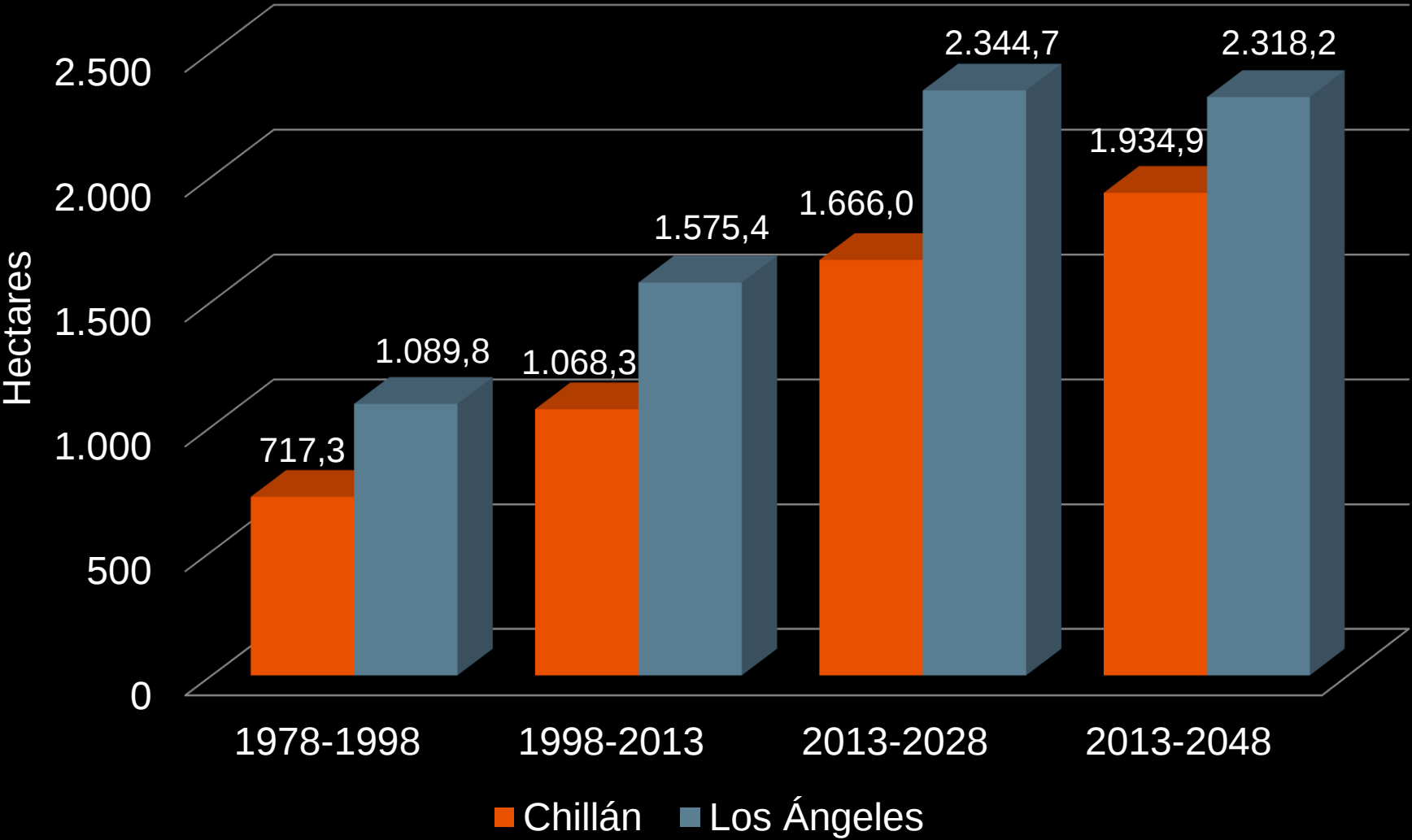
Nota: Usos de suelo: (1) Urbano; (2) Transportación; (3) Agricultura; (4) Bosque; (5) Agua; (6) Humedal; (7) Cauces; (8) Terrenos baldíos

Disagreement as observed change, change forecast and prediction error in Chillán and Los Ángeles (quantity, exchange and shift)



Impacts
1978-2048

Loss of agricultural soil 1978-2013



Urban planning: ¿2048?

Year	Urban Area (hectares) projected 2048		
	Inside urban boundary	Outside urban boundary	Total
Chillán	3,983.1 (75,4%)	1,303 (24,6%)	5,286.1
Los Ángeles	2,917.2 (50,6%)	2,855.5 (49,4%)	5,772.7

Land use change modelling applied to natural risk evaluation. Antofagasta-Mejillones, II Antofagasta Region

- **Objective:** Evaluate and simulate the urban growth and estimate the levels of future exposition to tsunami and mass movements in the city of Antofagasta and Mejillones, in north coastal Chile desert.



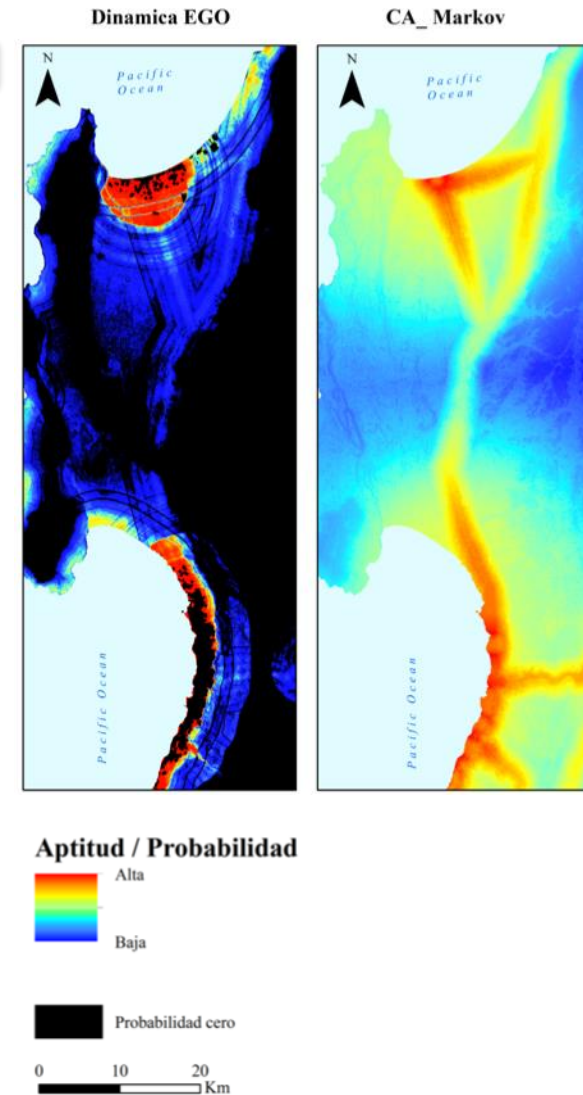
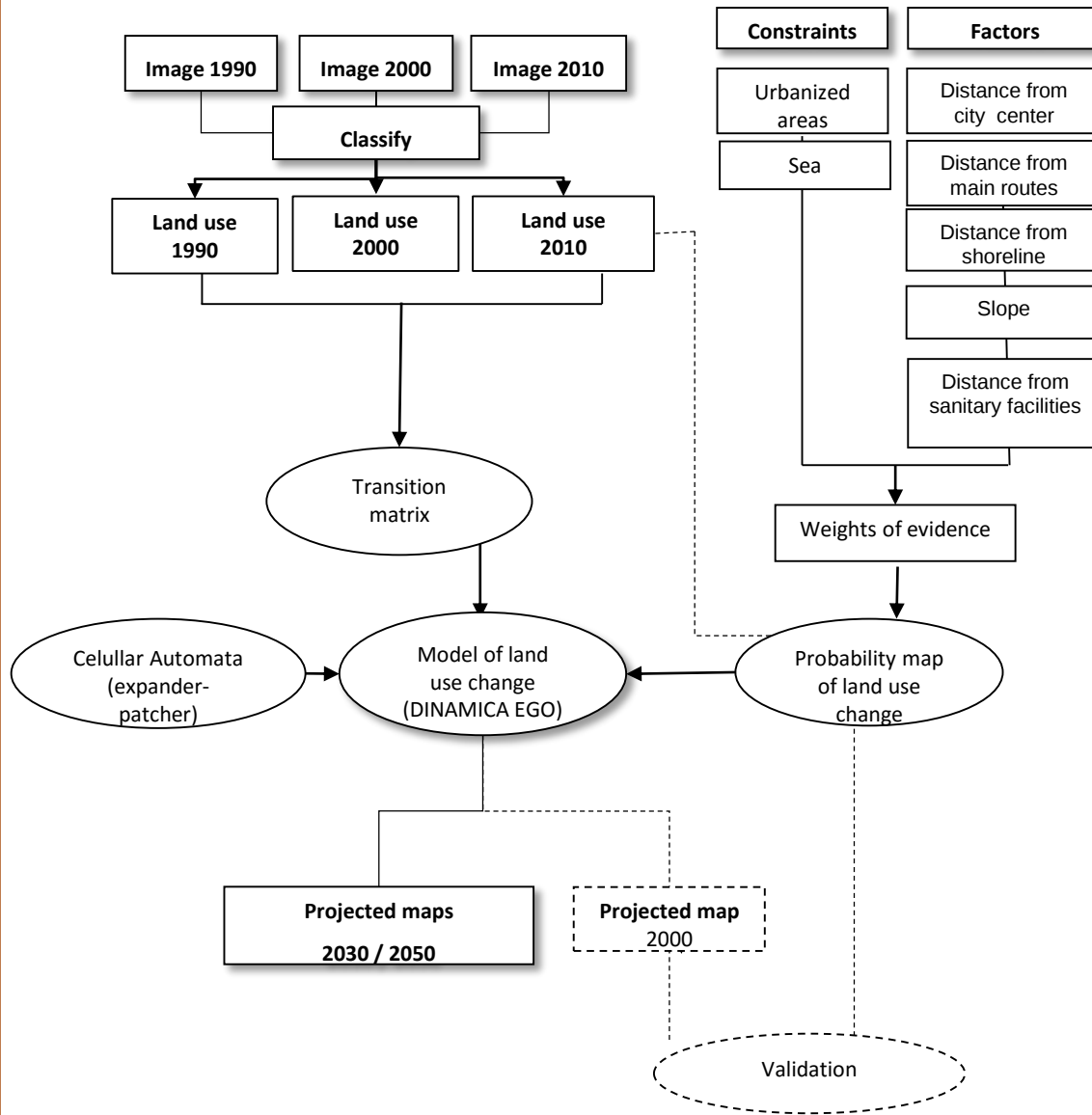
Example 2.

Urban land use change modelling applied to natural risk. Antofagasta-Mejillones, II Antofagasta Region

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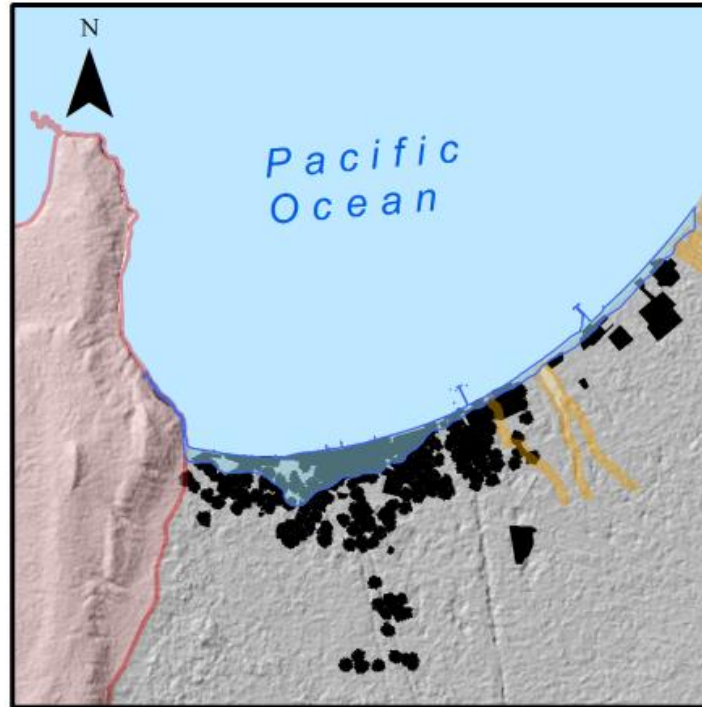
Dinamica EGO



Results



c. Reference 2010



f. Simulated 2050
(Dinamica EGO Model)



2030
) model)



f. Simulated 2050
(Dinamica EGO Model)



Conclusions

- The land use simulation provides a reasonable representation of the likely change in urban land use, both in patterns and amounts consumed land.
- We can not change the natural threat, but we can prevent where the city will grow and the risk level.
- This tool is useful in Urban Development Policy, Urban Regulatory Plan, Adaptation Plan, Strategic Evaluation Assessment (SEA), public policy, and so on.
- Future challenges?

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