



Universidad de Concepción



FACULTAD DE CIENCIAS
AMBIENTALES



EULA-CHILE
Centro de Ciencias Ambientales

10 años
CEDEUS

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Midiendo el paisaje y los servicios ecosistémicos asociados a su naturaleza

Workshop on Copernicus for Natural Capital and Ecosystems Services

City: Santiago

Date: November 30th, 2022



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P A I S U R L a b

Francisco de la Barrera

Facultad de Ciencias Ambientales– Eula Chile.
Centro de Desarrollo Urbano Sustentable (CEDEUS)

Universidad de Concepción

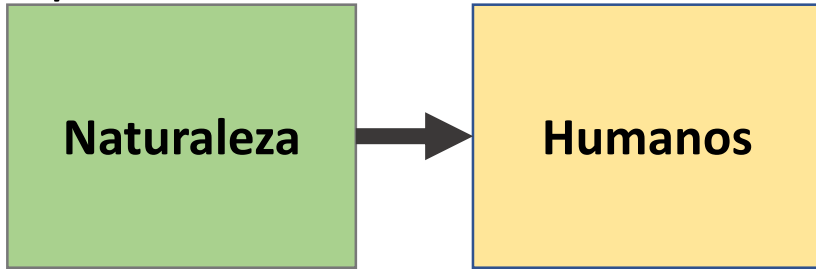
fdelabarrera@udec.cl



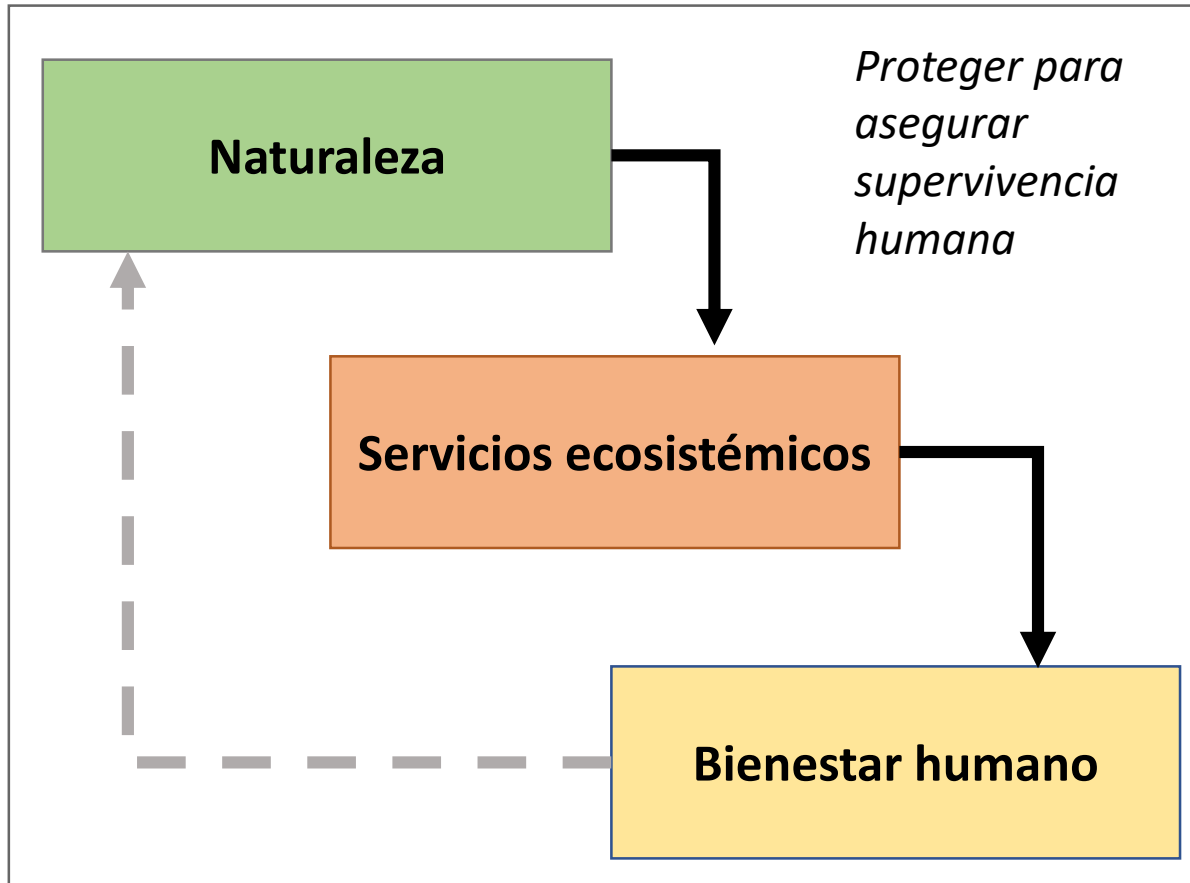
Topics

- Landscape ecology and ecological planning approach and goals
- Research on **urban ecosystems** dynamics and their ecosystem services
- Research on monitoring of **megafires** and their effects on landscape and ecosystem services
- Final remarks

Aprovechar



Paradigmas naturaleza y desarrollo sustentable



Naturaleza



Comunidades humanas

Asegurar persistencia de procesos ecológicos y del derecho a la vida de entes no-humanos

An aerial photograph of a coastal city, likely in Chile, showing a large bay on the left, a river winding through the city and into the bay, and steep, forested mountains in the background. A major highway (Ruta 5) runs through the city. The text is overlaid on the left side of the image.

La naturaleza y los servicios ecosistémicos

¿Qué había? ¿Qué queda?

¿Qué beneficios genera?

¿Cómo podemos protegerla y recuperarla?

¿Dónde?

Piezas claves del paisaje



Núcleo



Nodo



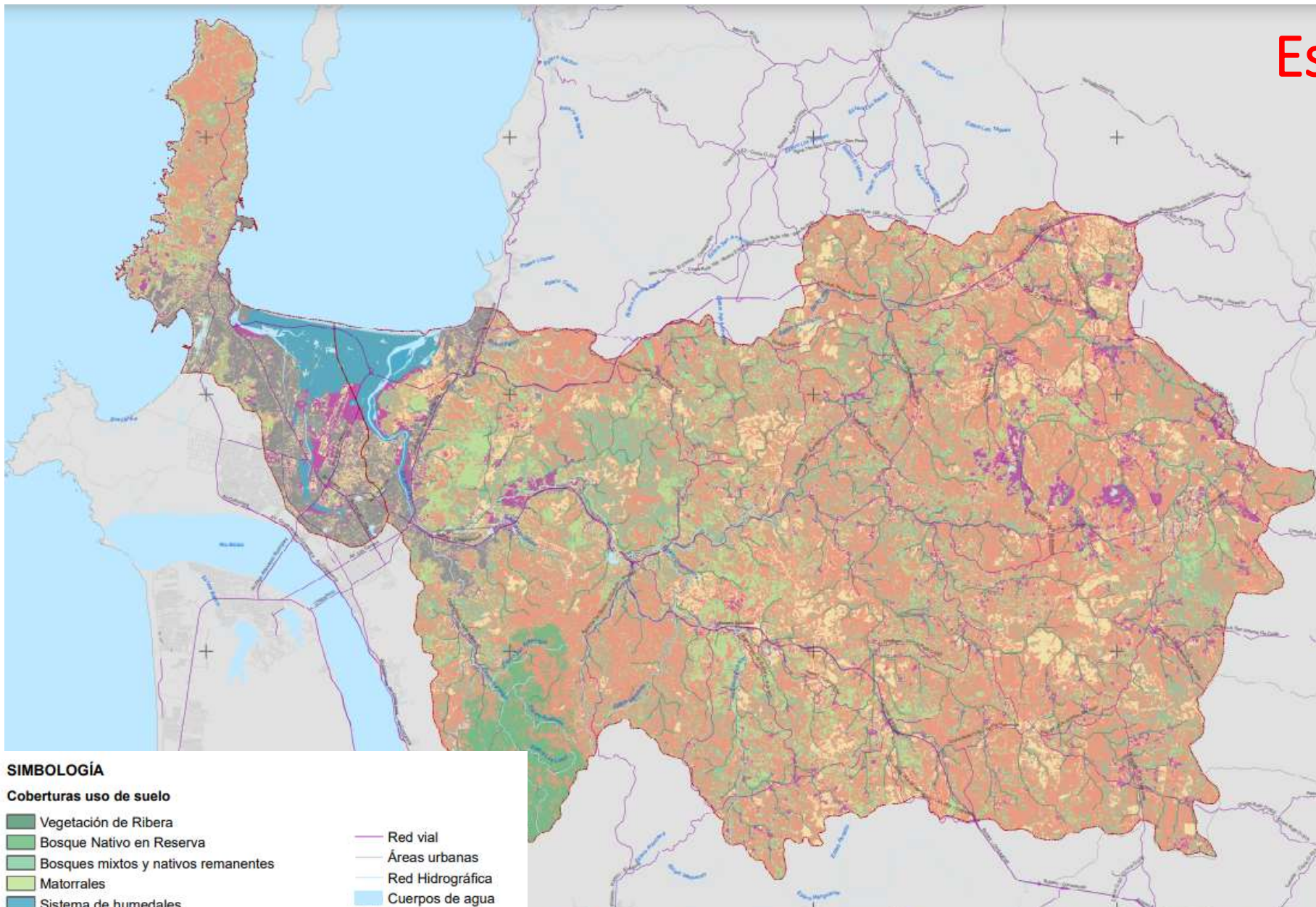
Conector



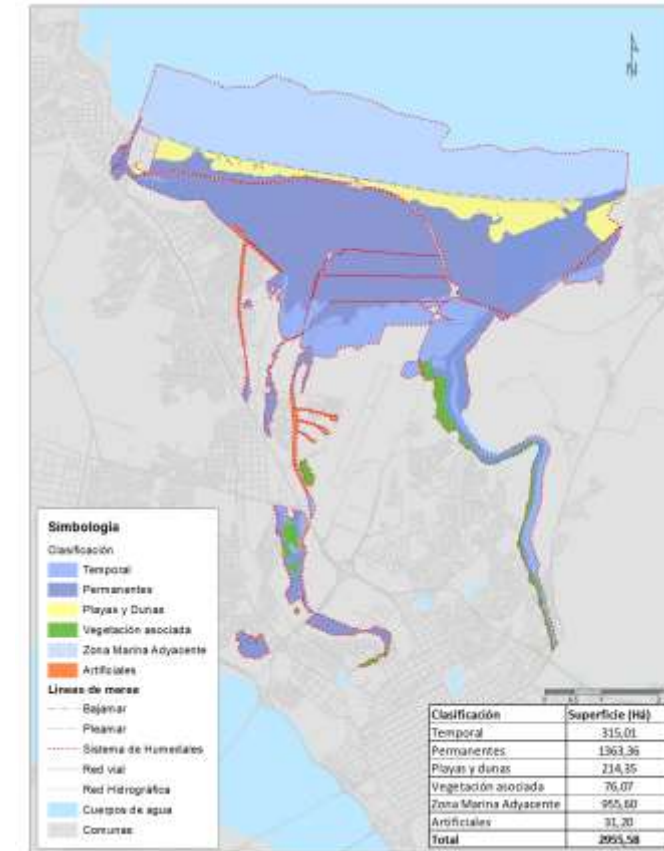
OCUC

10 años
CEDEUS

Estructura del paisaje para delimitar piezas clave

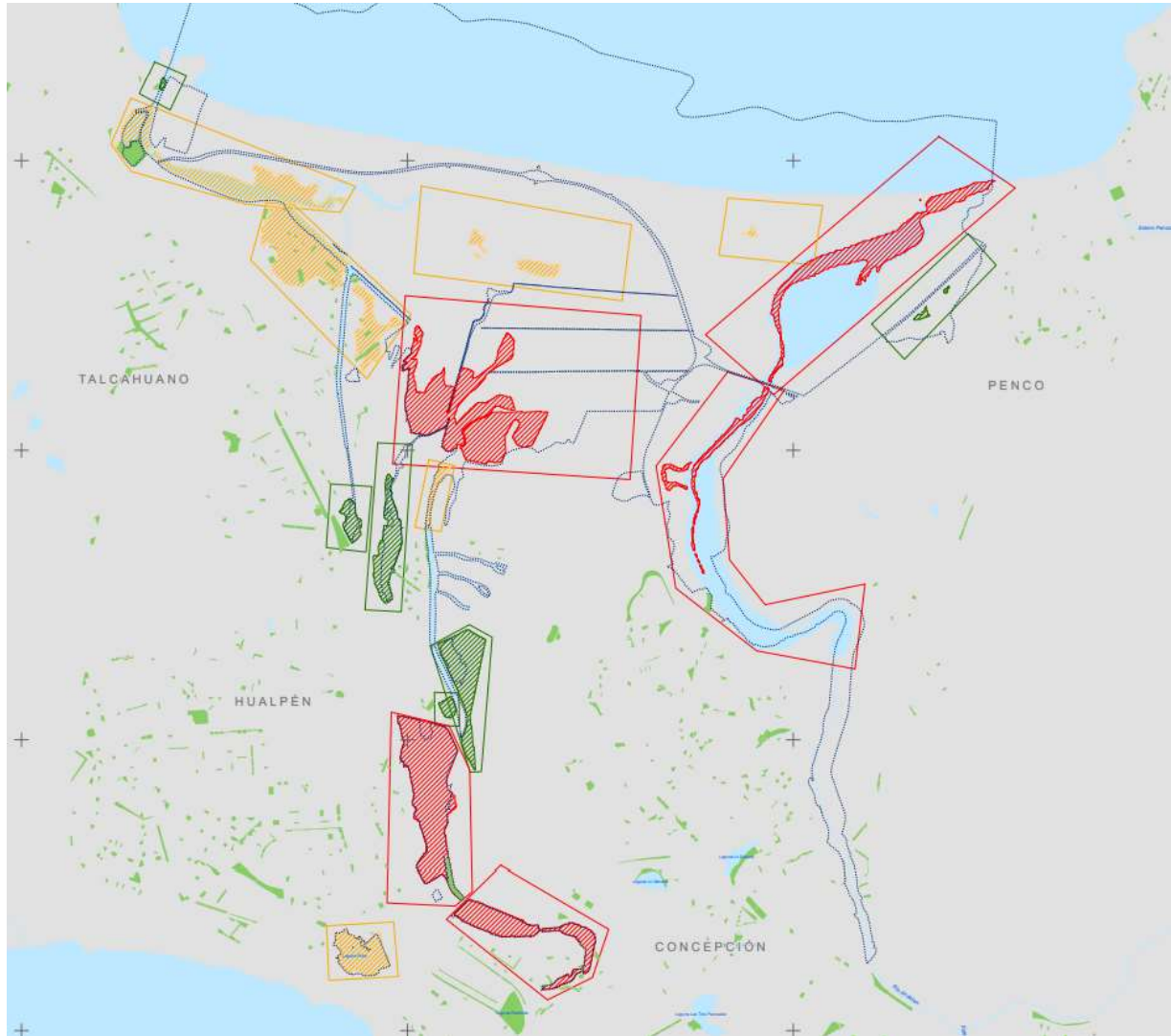
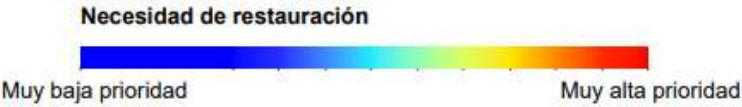
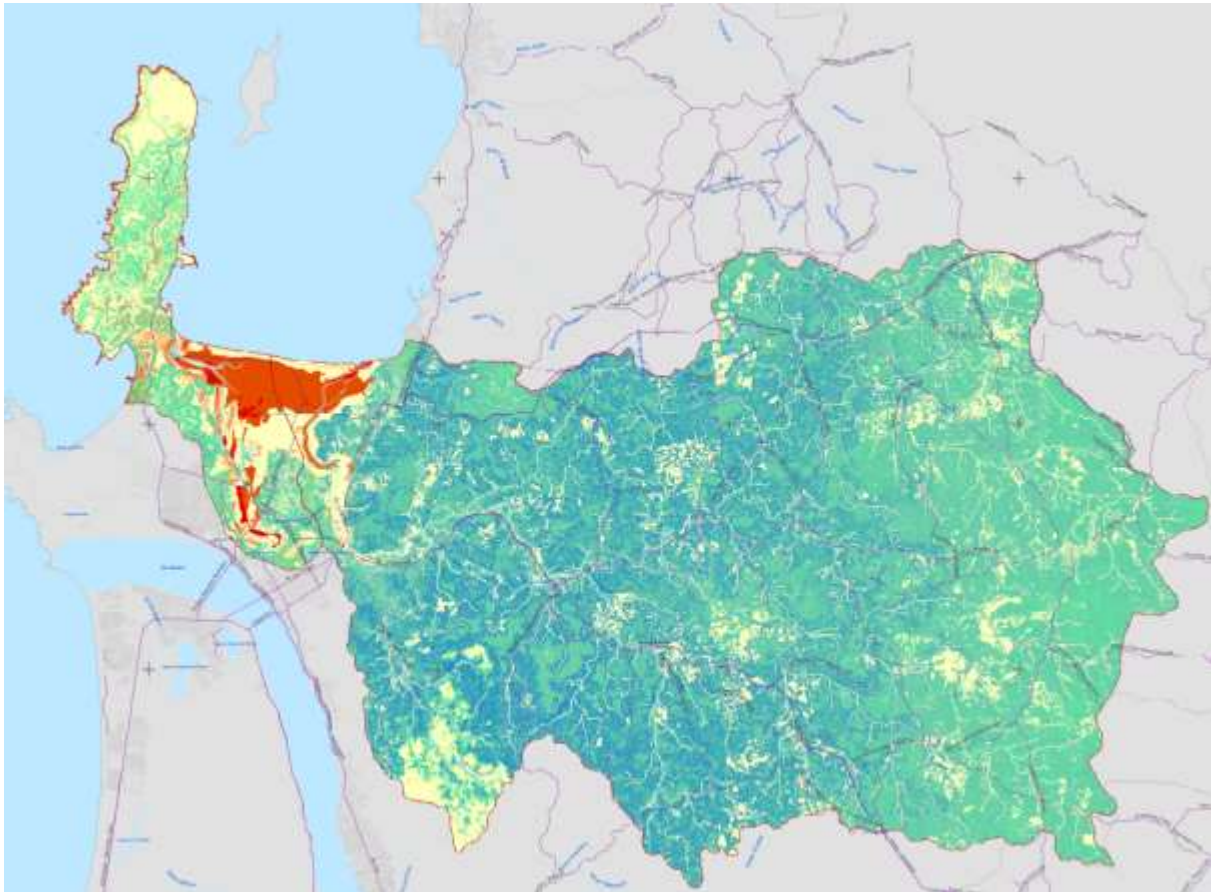


"Cartografía elaborada bajo el Proyecto GEFSEC ID: 9766 Promoviendo la conservación y el manejo sostenible de los humedales costeros y sus cuencas aportante, a través de la mejora en la gestión y planificación de los ecosistemas de borde costero de la zona centro sur de Chile, hotspot de biodiversidad"



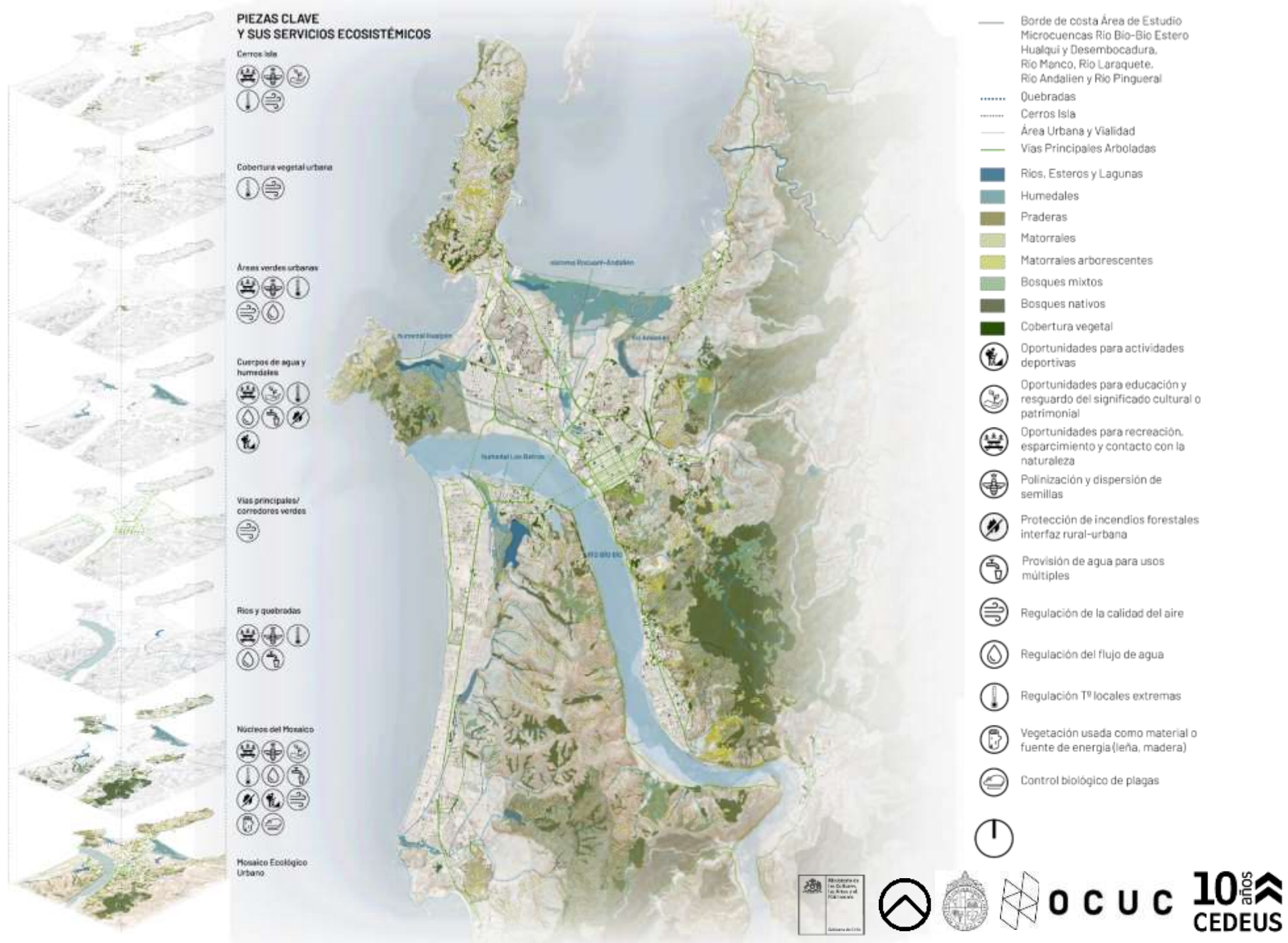
Rojas et al. 2021. Definición de límites e identificación de áreas prioritarias a restaurar del Sistema Humedal Rocuant-Andalién-Vasco Da Gama-Paicavi-Tucapel Bajo, comunas de Concepción, Hualpén, Talcahuano y Penco, Región del Biobío. GEF-URBANCOST

Identificar necesidades y prioridades de restauración ecológica



Rojas et al. 2021. Definición de límites e identificación de áreas prioritarias a restaurar del Sistema Humedal Rocuant-Andalién-Vasco Da Gama-Paicaví-Tucapel Bajo, comunas de Concepción, Hualpén, Talcahuano y Penco, Región del Biobío. GEF-URBANCOST

Planificación ecológica



Acciones de planificación ecológica



Cerros Isla:
Nodos



Cobertura Vegetal Urbana:
Nodos



Áreas Verdes Urbanas:
Nodos



Cuerpos de Agua y
Humedales:
Núcleos



Vías Urbanas Arboladas:
Conectores

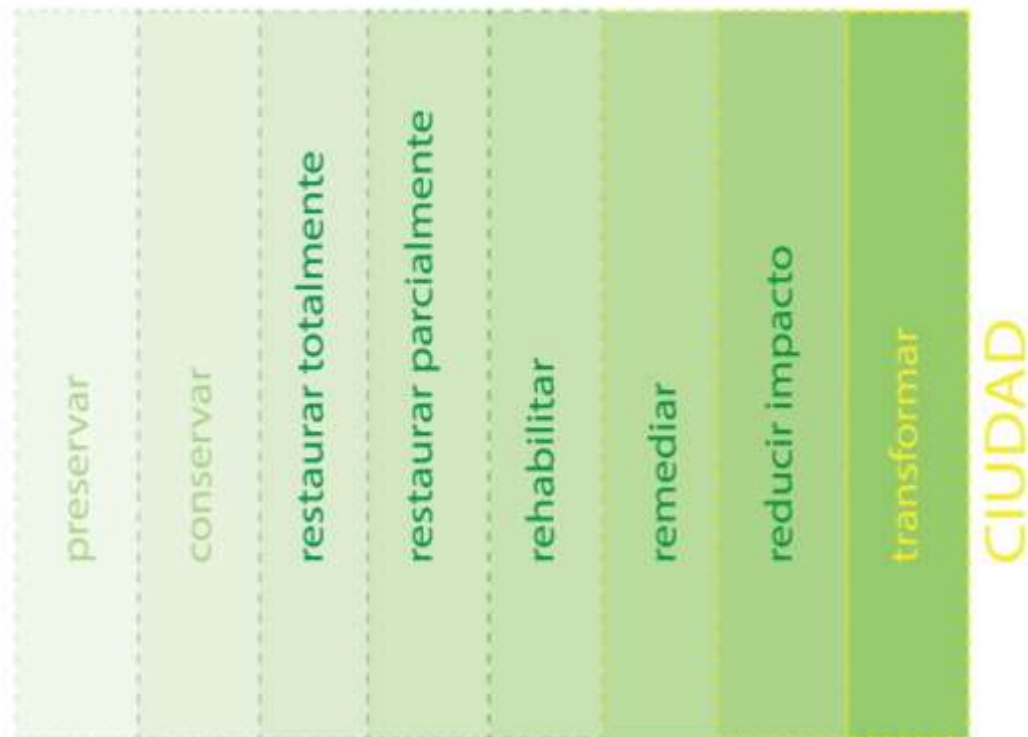


Cursos de Agua:
Conectores



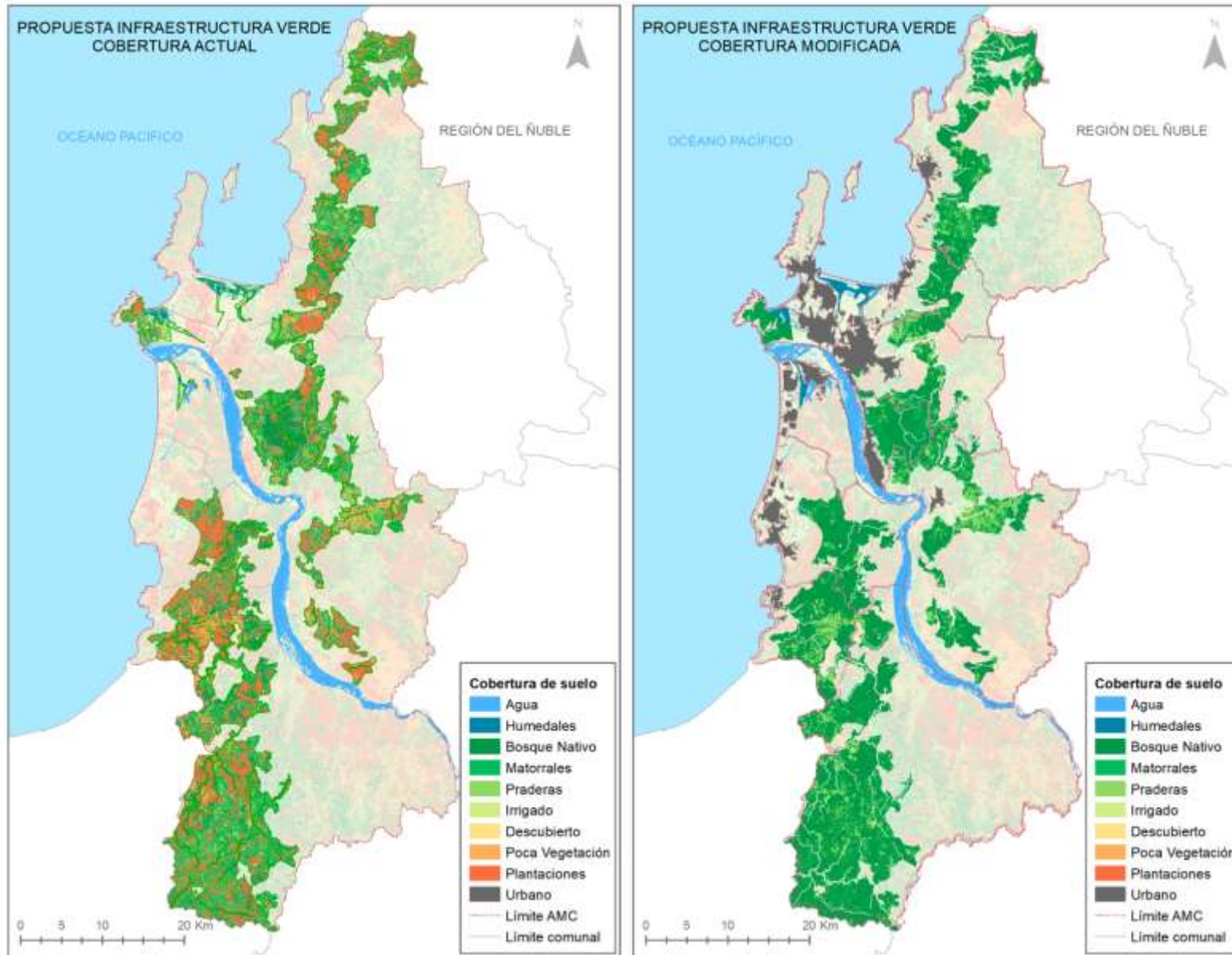
Remanentes Naturales:
Núcleos Ecológicos

NATURALEZA



<http://www.cerrosisla.cl/cerros-isla-de-chile>

Cinturón verde para Concepción Metropolitano





URBAN ECOSYSTEM SERVICES IN MYRIAD OF GREEN SPACES COVERING A LONG LATITUDINAL GRADIENT



Valoración y evaluación de servicios socio-ecosistémicos locales.

ANID/Fondecyt Regular 1202003

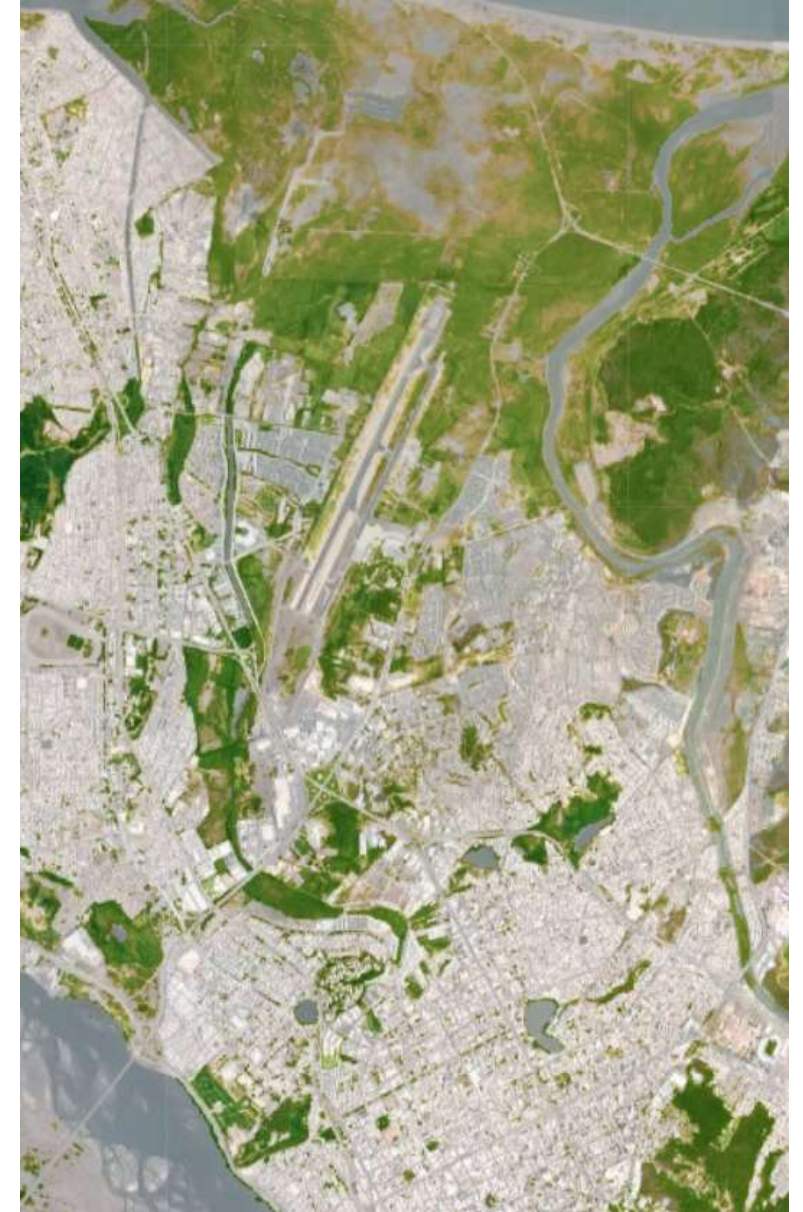
2021-2023

www.ecosistemasurbanos.cl



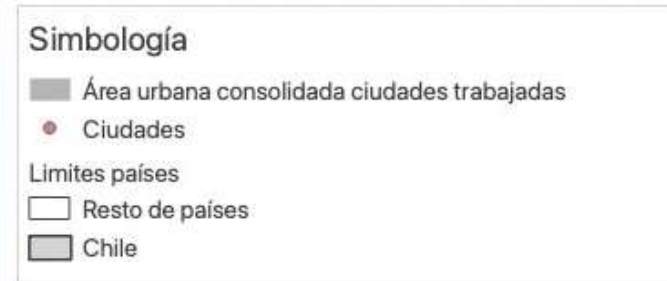
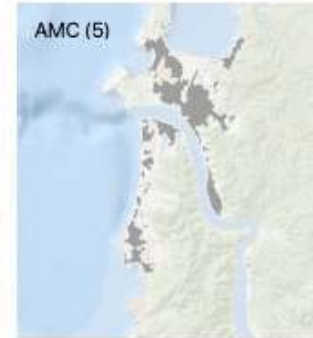
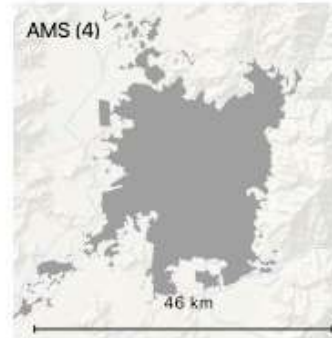
Objetivos

- Evaluar cómo se estructuran los espacios verdes en términos de la vegetación que contienen y cómo ésta varía en un gradiente latitudinal, haciendo uso de técnicas de clasificación de coberturas del suelo.
- Evaluar grupos de servicios ecosistémicos a partir de expertos
- Cuantificar 4 servicios ecosistémicos:
 - polinización
 - provisión de frutales
 - almacenamiento de carbono
 - amortiguación de la temperatura
- Contrastar existencia de diferencias entre tipologías de espacios verdes y entre mediciones insitu y valoración de expertos





Chilean cities under evaluation of their green spaces and ecosystem services





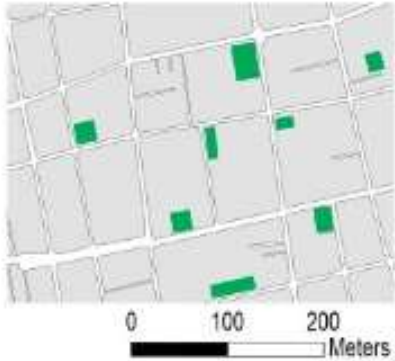
Chilean cities under evaluation of their green spaces and ecosystem services

City, conurbation (C) and/or metropolitan area (MA)	Population (inhab.)	Geographic coordinates	Dominant climate based on modified Köppen-Geiger classification.
Arica	205,000	18.47°S, 70.32°O	BWh Hot Desert climate
Iquique (C)	295,000	20.21°S, 70.15°O	BWh Hot Desert climate
Antofagasta	155,000	23.64°S, 70.39°O	BWk Cold Desert climate
Copiapó	150,000	27.36°S, 70.33°O	BWk Cold Desert climate
La Serena (C)	415,000	29.90°S, 71.25°O	BSk'(s) Cold Semi-arid climate with dry summer and oceanic influence
Valparaiso (MA)	945,000	33.04°S, 71.61°O	Csb' Mediterranean climate (warm summer) with oceanic influence
Santiago (MA)	6,105,000	33.43° S, 70.65° O	Csb Mediterranean climate (warm summer)
Rancagua (C)	285,000	34.17°S, 70.74°O	Csb Mediterranean climate (warm summer)
Talca (C)	250,000	35.42°S, 71.66°O	Csb Mediterranean climate (warm summer)
Chillán (C)	250,000	36.60°S, 72.10°O	Csb Mediterranean climate (warm summer)
Concepción (MA)	930,000	36.82°S, 73.05°O	Csb' Mediterranean climate (warm summer) with oceanic influence
Temuco (C)	310.000	38.73°S, 72.59°O	Csb Mediterranean climate (warm summer)
Valdivia	155,000	39.81°S, 73.24°O	Cfb'(s) Marine West Coast climate (warm and dry summer) with oceanic influence
Puerto Montt	250,000	41.47°S, 72.94°O	Cfb' Marine West Coast climate (warm summer) with oceanic influence
Coyhaique	50,000	45.57°S, 72.06°O	Cfb Marine West Coast climate (warm summer)
Punta Arenas	125,000	53.16°S, 70.90°O	Csc Mediterranean climate (mild summer)





Green spaces typologies



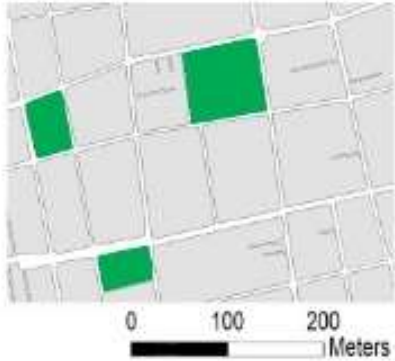
Residential green spaces (RGS)

- Area: 500 sq.m to 5,000 sq.m
- Irregular shape and small areas.
- RG are located in the neighborhoods



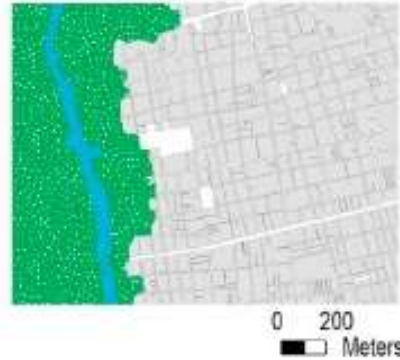
Urban parks (UP)

- Area: 20,000 sq.m to 100,000 sq.m
- Open/public spaces with proper equipment, e.g: seating, streets lights, signals, etc.



Local parks (LP)

- Area: 5,000 sq.m to 20,000 sq.m
- Regular shape and often part spaniard dameros. This main square related to the civic center



Urban natural remnants (UNR)

- Area: >100,000 sq.m
- Semi-natural parks, e.g: urban hills, mountain ranges on the edge of the city, wetlands, river edge, etc.





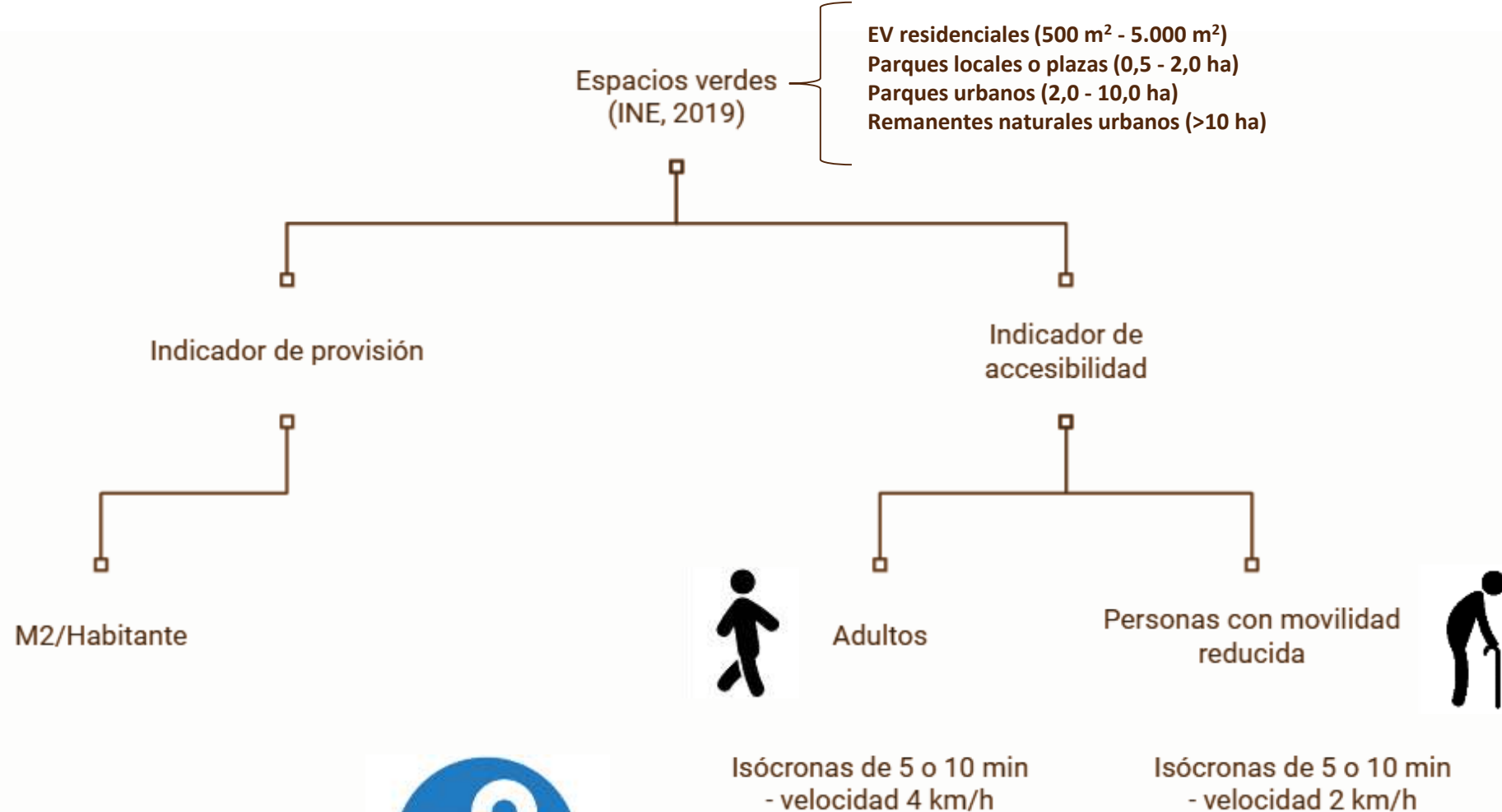
Methods

- Database of urban green spaces (UGS)
 - N = 11,340; 293 UP; 4,000 ha of RGS, LP and UP.
 - Clusterization by typologies (size), types of vegetation and socio-material variables
- UGS indicators
 - Availability (sq.m/inhab) & accessibility
- Land cover classification within RGS
 - Sentinel-2, Random forest, Google Earth Engine
- Expert-based valuation of ecosystem services, by UGS typologies and cities
 - 21 experts
- In situ measurements in 94 UGS
 - Selection by clustering of green spaces tipologies and land cover
 - Air temperature, structural measurements of trees
 - Plant composition: pollinating plants and fruit trees





UGS indicators





Green spaces in Chilean cities

5,1 sq.m/inhab.

RGS: 2,4 sq.m/inhab.

LP: 1,3 sq.m/inhab.

UP: 1,7 sq.m/inhab.

UNR: 26,7 sq.m/inhab.

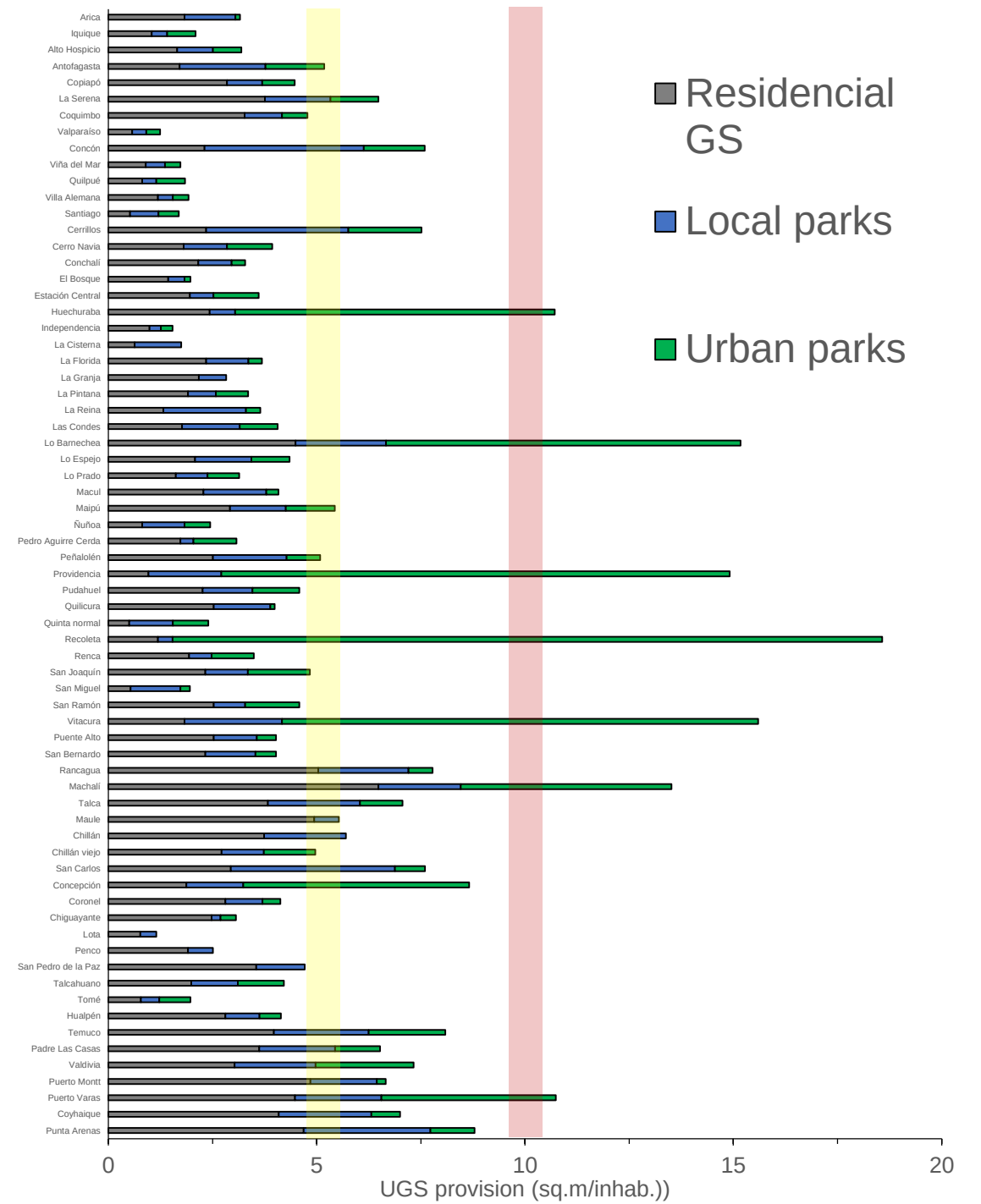
Urban green spaces provision
does not meet accessibility.

Each typology of UGS plays a
specific role in pursuit of
sustainable development goals.

Monitoring UGS indicators needs
detailed characterization of UGS
typologies.

*Northern
(arid cities)*

*Southern
(humid cities)*





UGS accessibility

Espacios verdes residenciales

65% adultos (vel. normal)

29% vel. reducida

Parques locales (plazas)

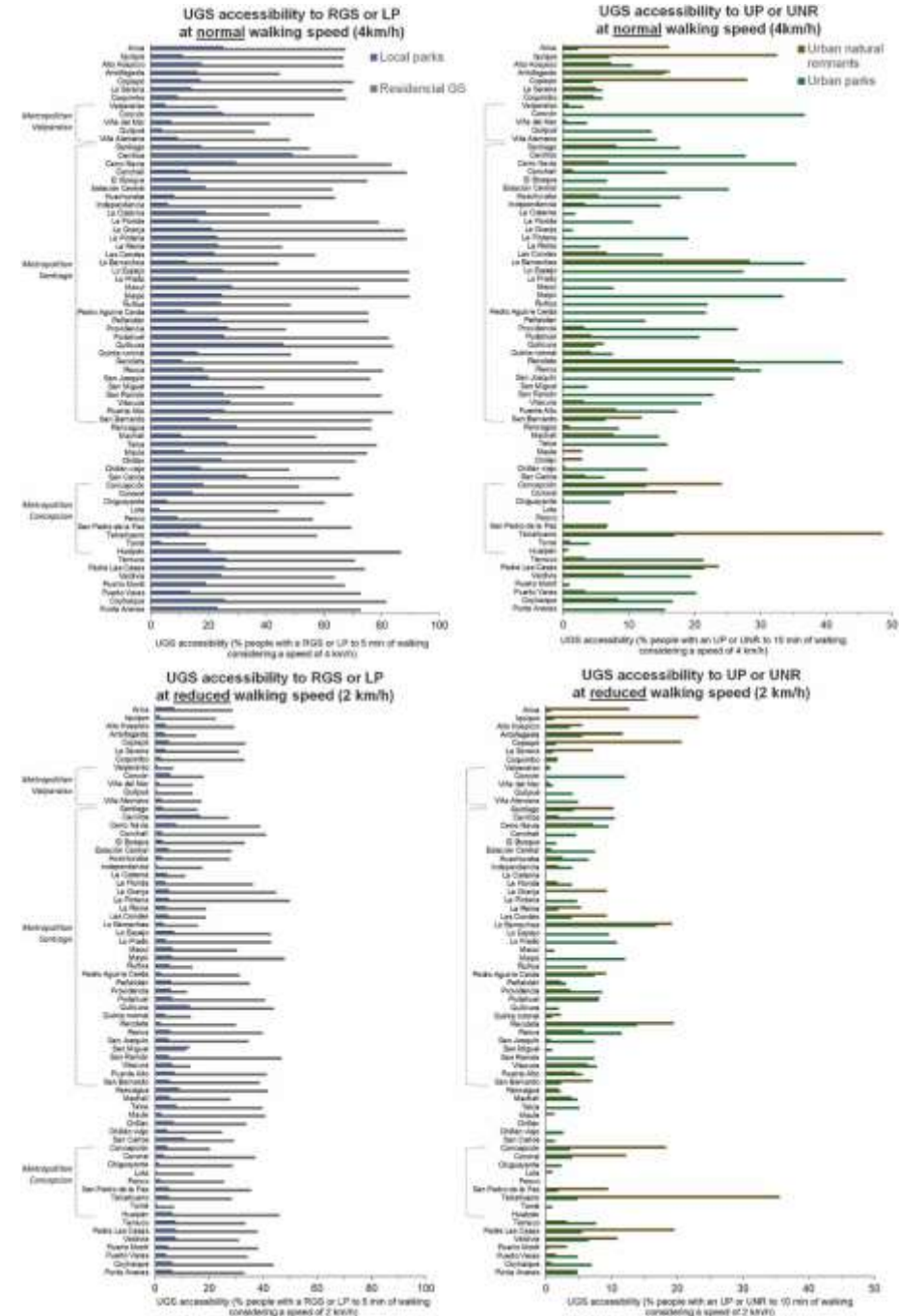
19% vel. normal

4,9% vel. reducida

Parques urbanos (*10')

14% vel. normal

4,6% vel. reducida

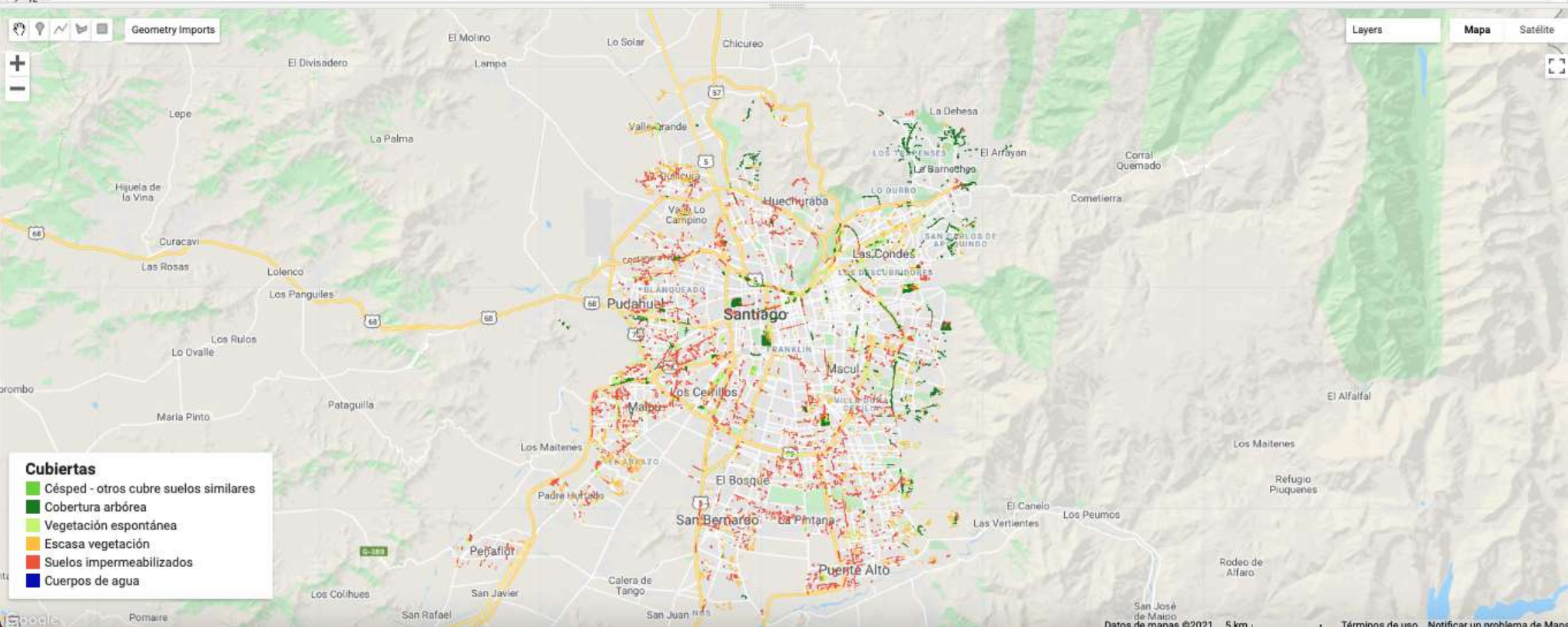


Get Link Save Run Reset Apps

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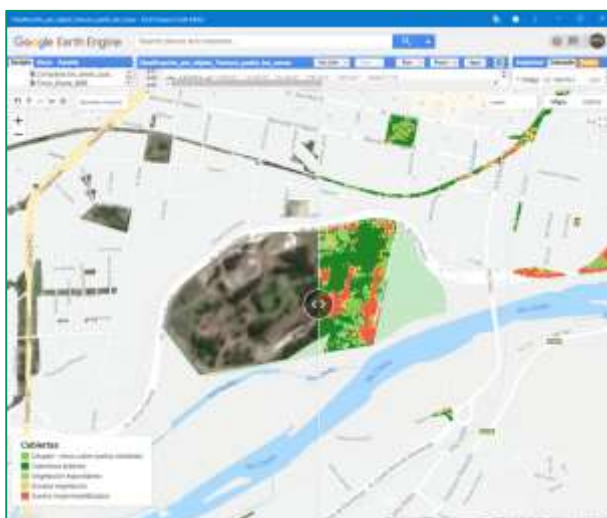
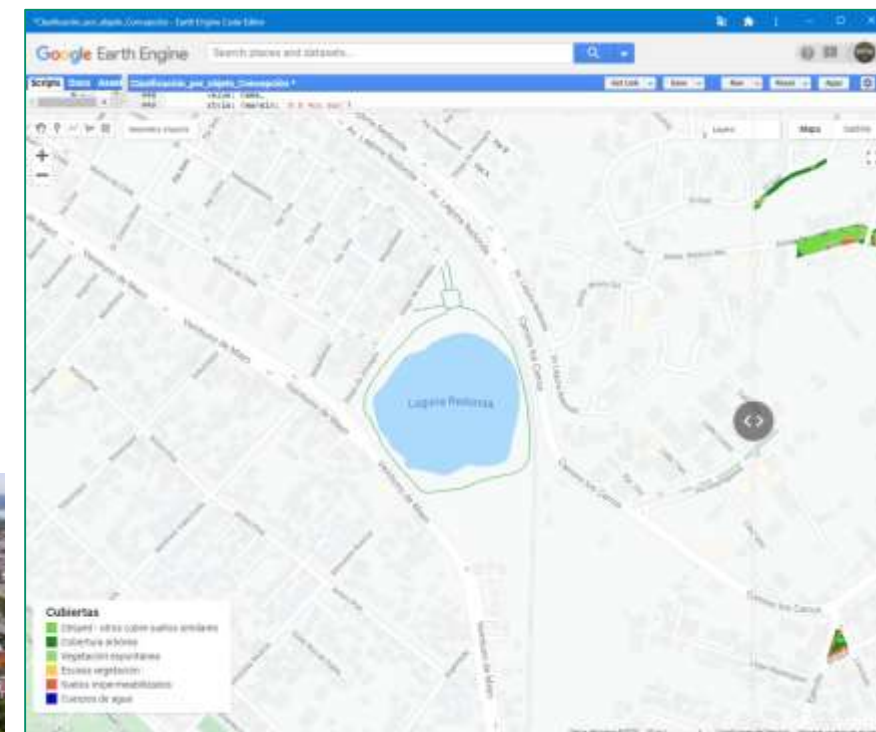
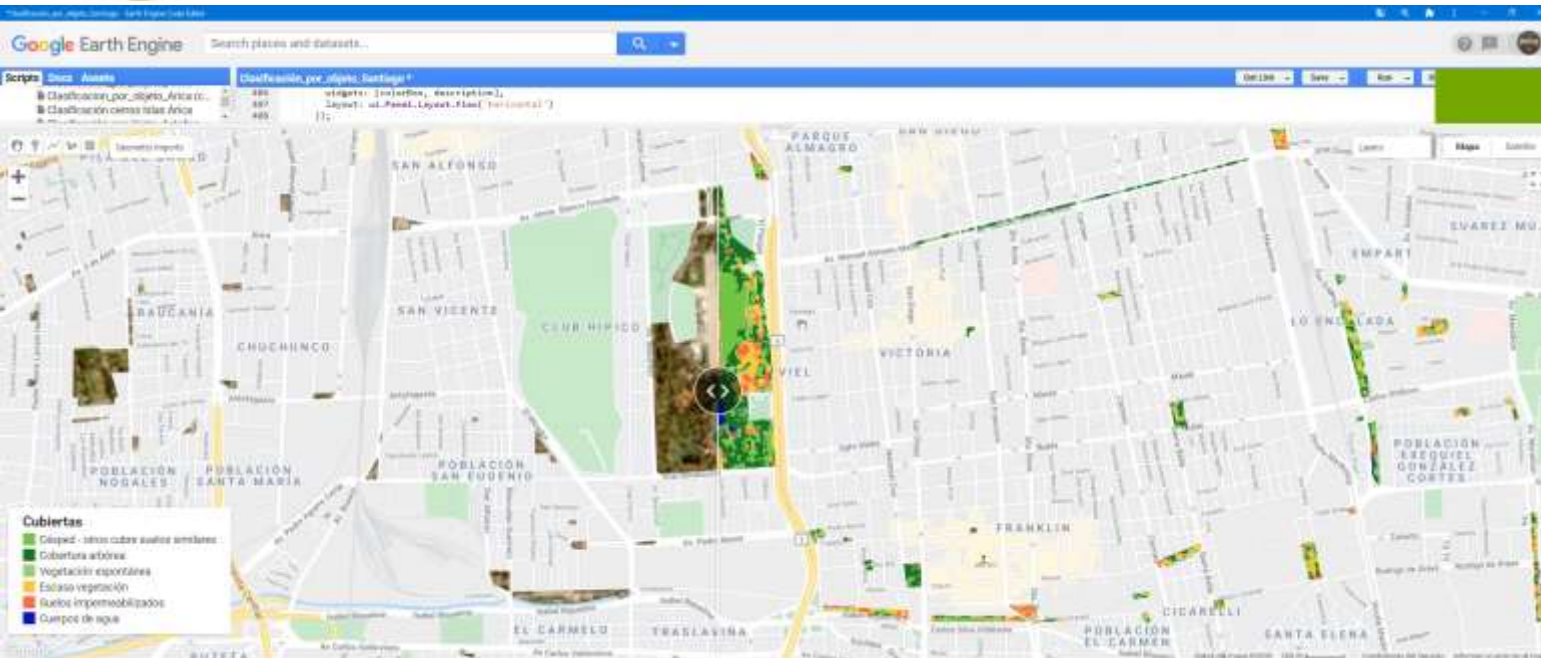
1 //Definición de la colección de imágenes a trabajar, filtrando por fecha,
2 //porcentaje máximo de nubes, geometría, bandas, filtro de índice, selección de la banda y
3 //estadístico usado (promedio-mínimo-máximo-el rango se hizo por fuera)
4
5 var collection = ee.ImageCollection('COPERNICUS/S2_SR').filterDate('2019-08-01','2019-08-30').filterBounds(fc).limit(10,'CLOUDY_PIXEL_PERCENTAGE').filter(ee.Filter.lt('DARK_FEATURES_PERCENTAGE',20)).mosaic()
6 print(collection)
7
8 var collection_1 = ee.ImageCollection('COPERNICUS/S2_SR').filterDate('2019-08-01','2019-08-30').filterBounds(fc).filter(ee.Filter.lte('CLOUDY_PIXEL_PERCENTAGE',20))
9 print(collection_1)
10
11 var collection2 = ee.ImageCollection('COPERNICUS/S2_SR').filterDate('2019-08-01','2019-08-30').filterBounds(fc).limit(10,'CLOUDY_PIXEL_PERCENTAGE').mosaic()
12 print(collection2)
13
14 Map.addLayer({eeObject:fc,name:'poligono area verde'})
15 Map.centerObject(fc)
16
17 //Se corta la colección por el área trabajada y seleccionan bandas de la imagen nativa
18
19 var agua = collection.clip(fc).select('SCL')
20
21 var agua2 = agua.eq(6)
22
23 Map.addLayer(agua2)
24

```





Land cover of urban green spaces



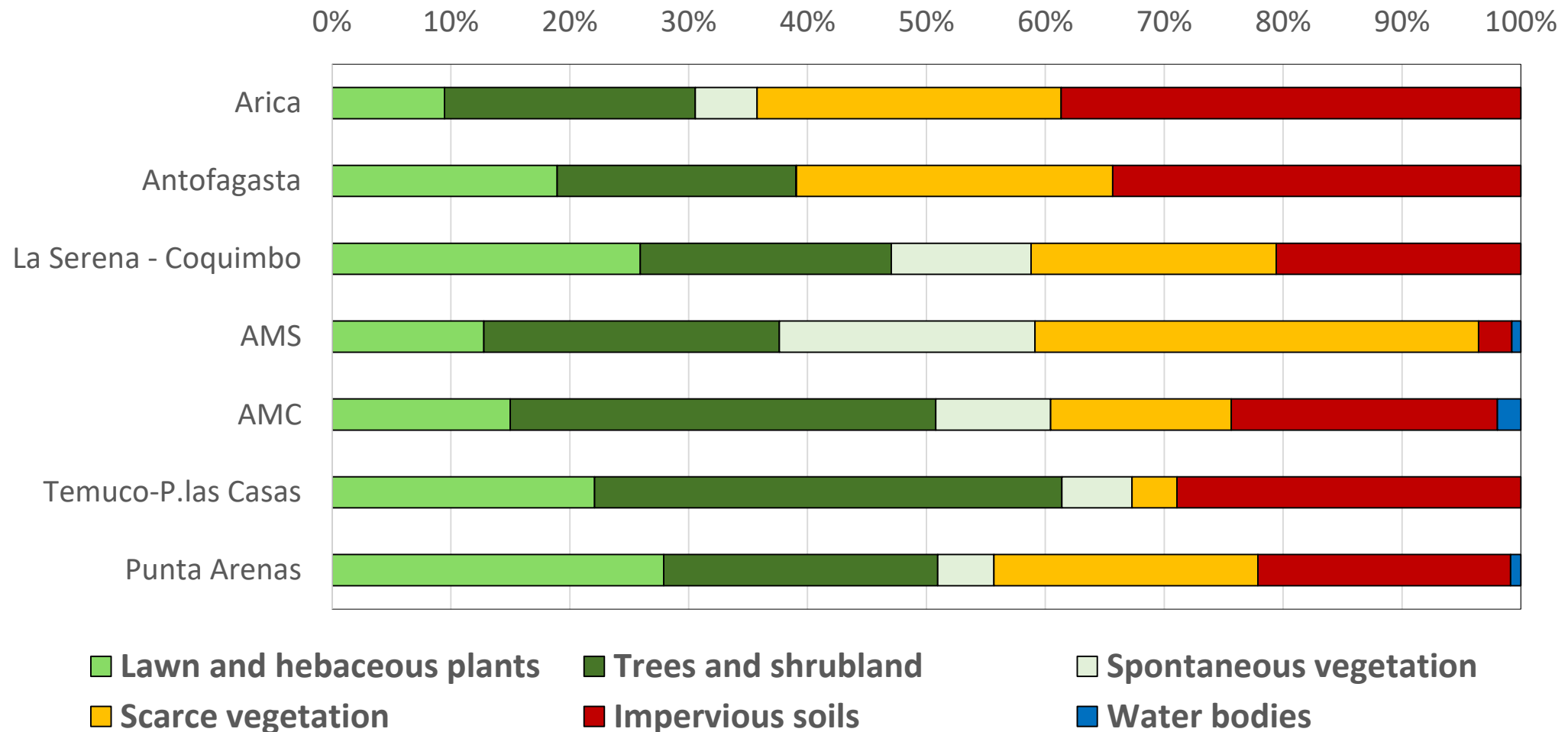


Land cover of urban green spaces

Kappa

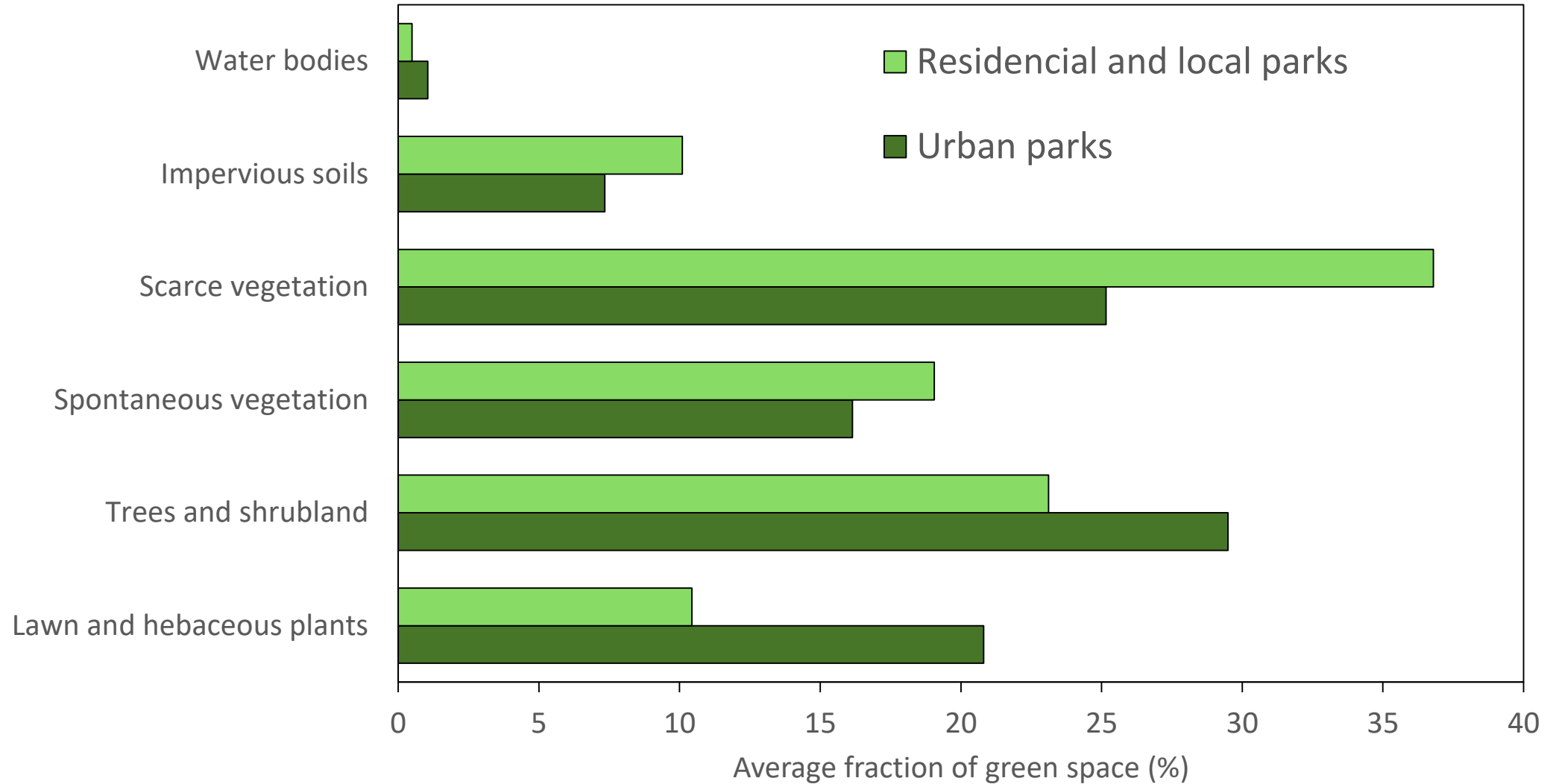
Arica	Antofagasta	La Serena - Coquimbo	AMS	AMC	Temuco-Padre Las Casas	Punta Arenas
0,852	0,779	0,718	0,890	0,756	0,687	0,766

Land cover of green spaces





Land cover of urban green spaces





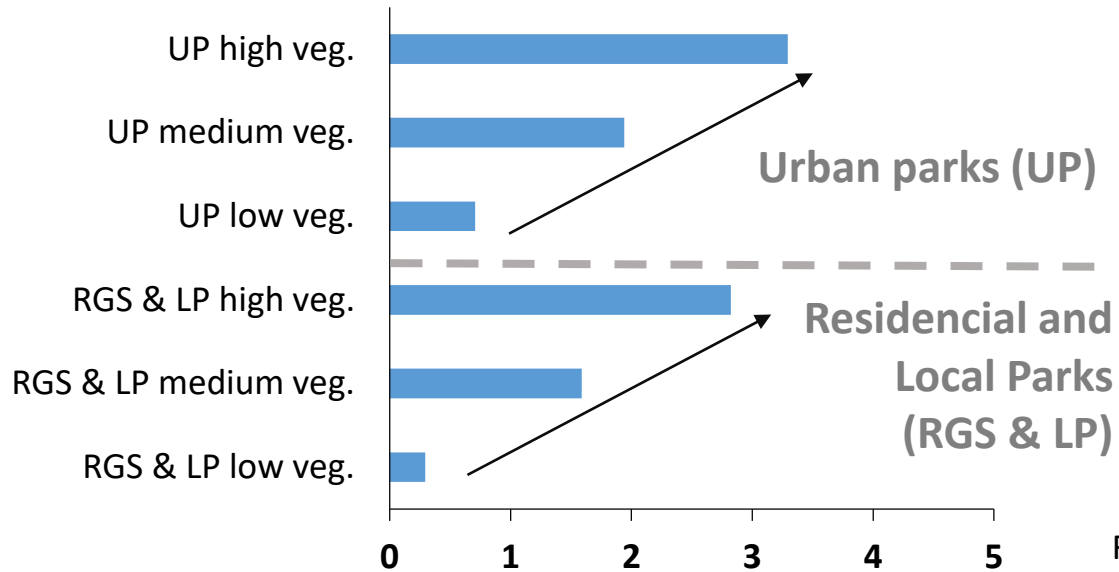
“Entreparques” – San Pedro de la Paz



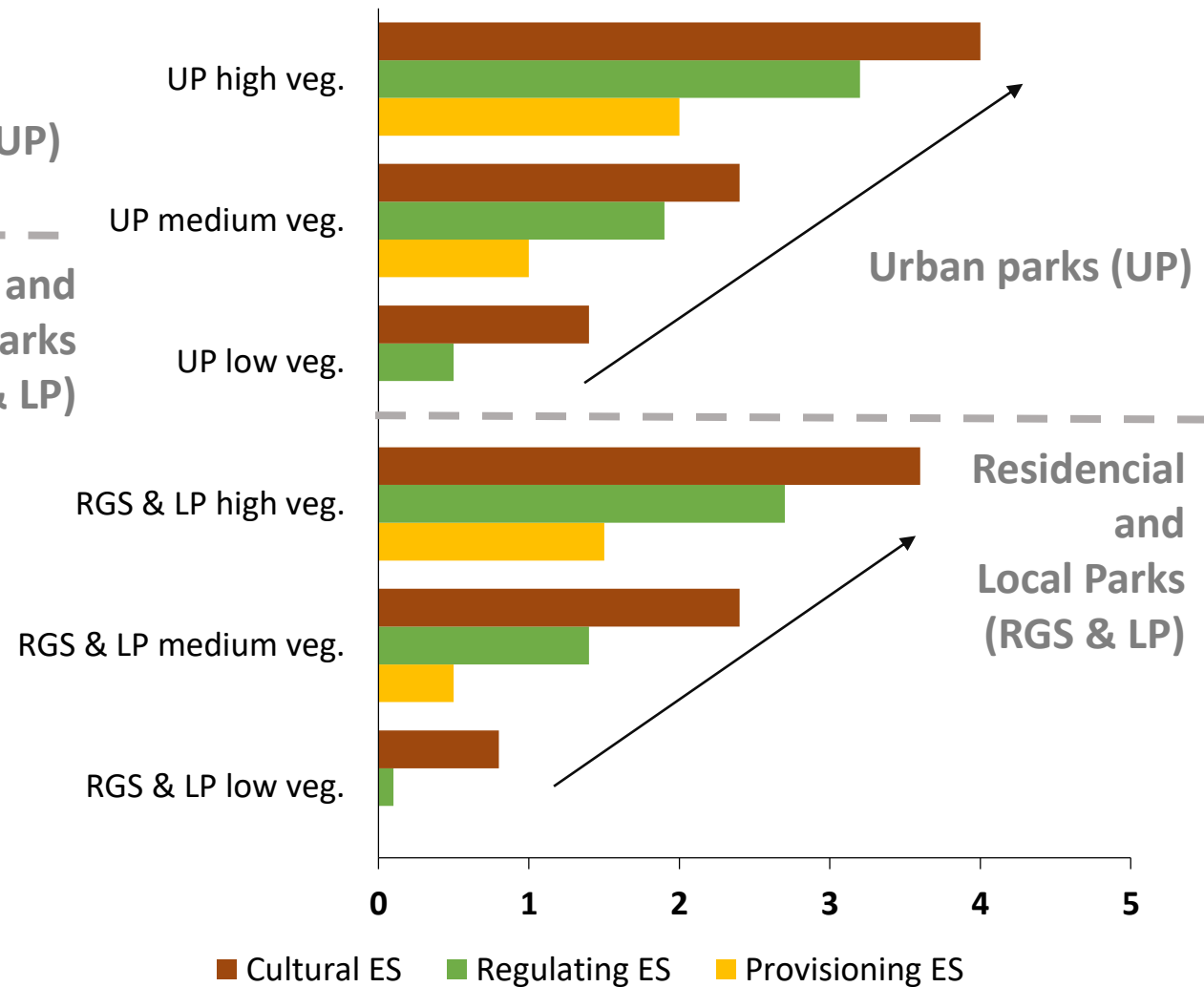
SERVICIOS
ECOSISTÉMICOS

Expert valuation of ecosystem services by type of green space

All ecosystem services



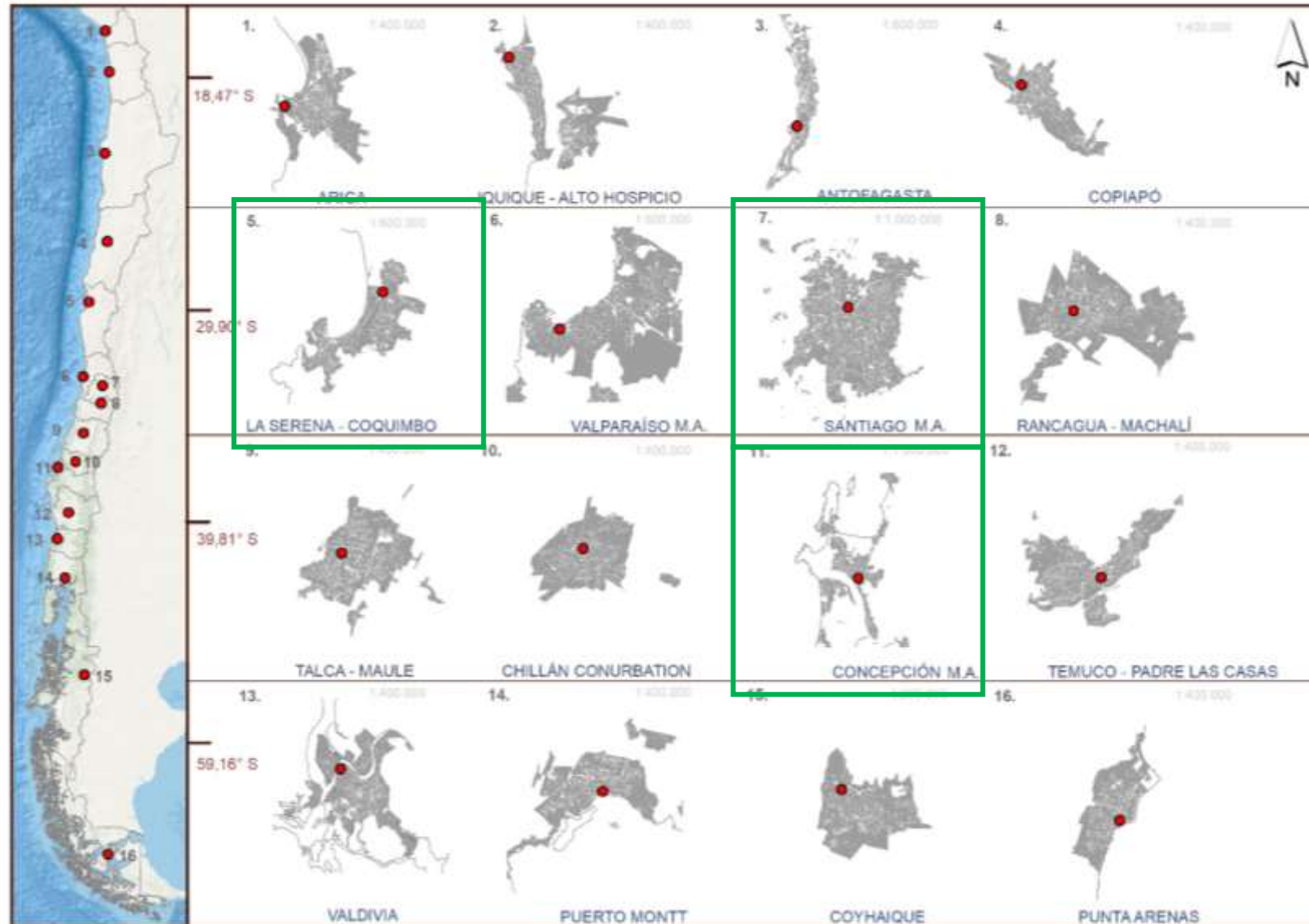
Groups of ecosystem services



- Significant differences between types of RGS & LP, and types of UP
- No difference between northern and southern cities.

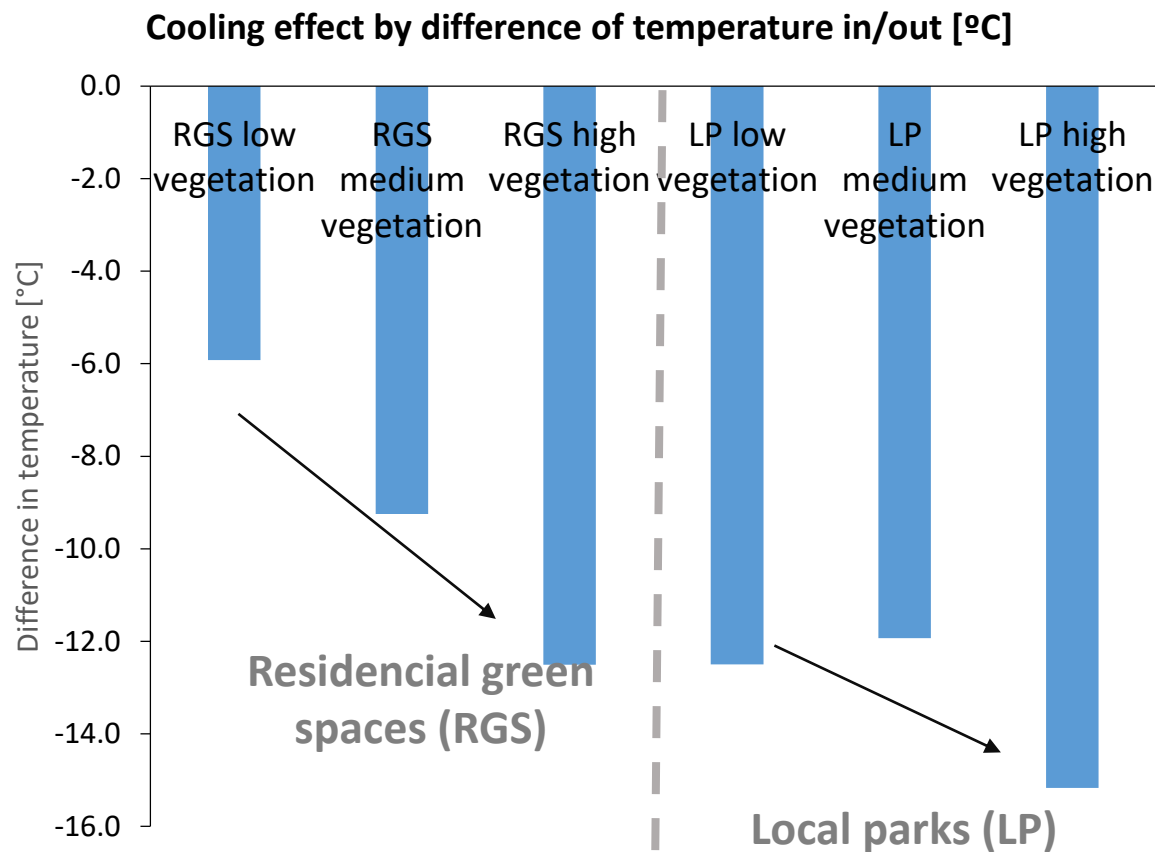
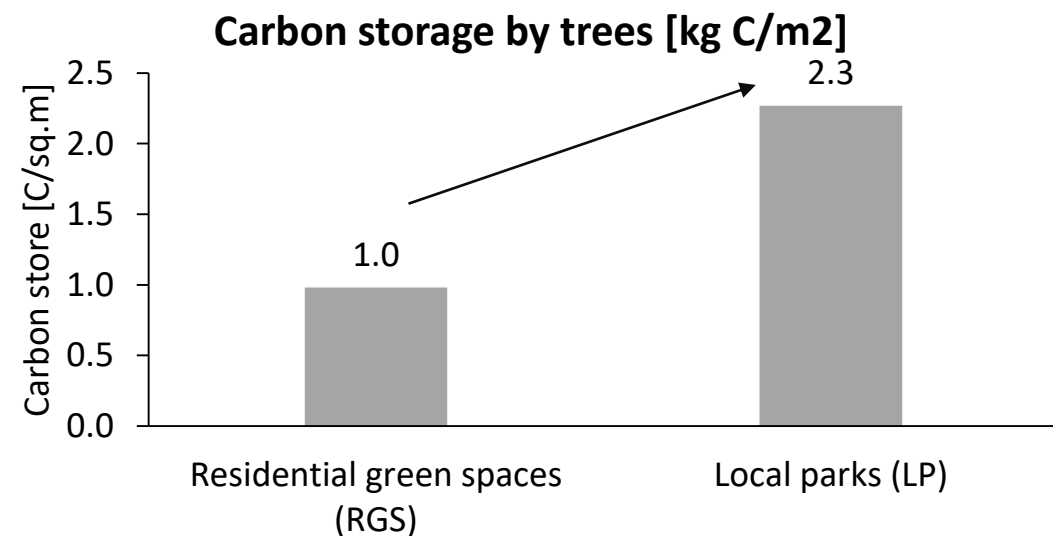
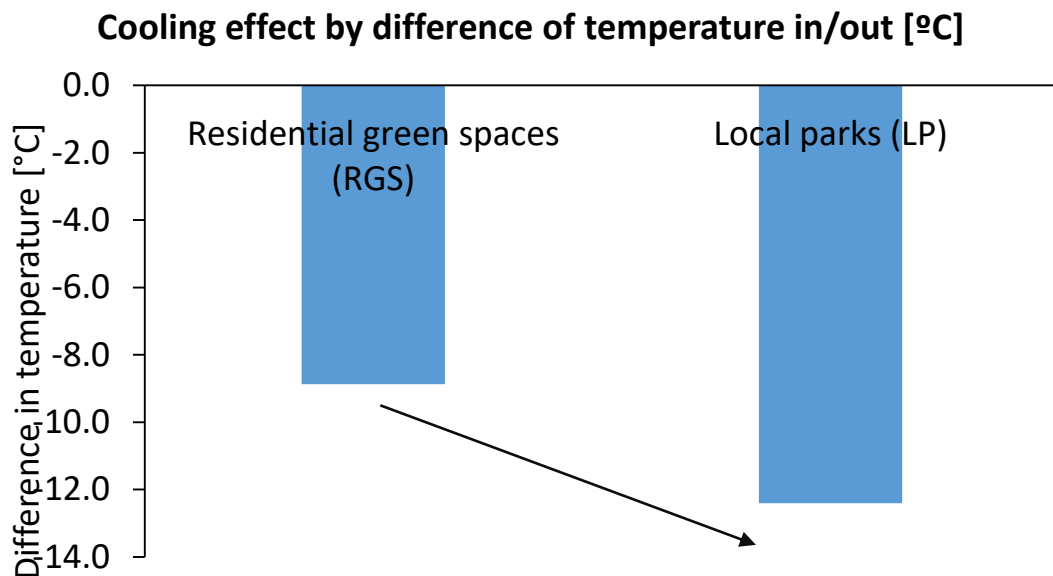


Chilean cities under evaluation of their green spaces and ecosystem services

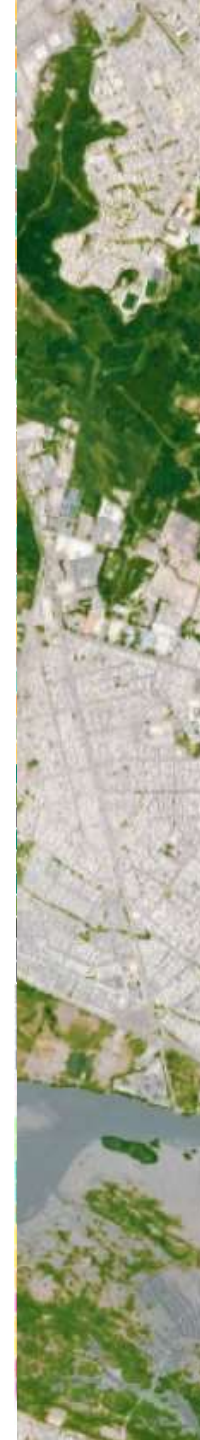




In situ measurement: Cooling effect and carbon storage depend of UGS size

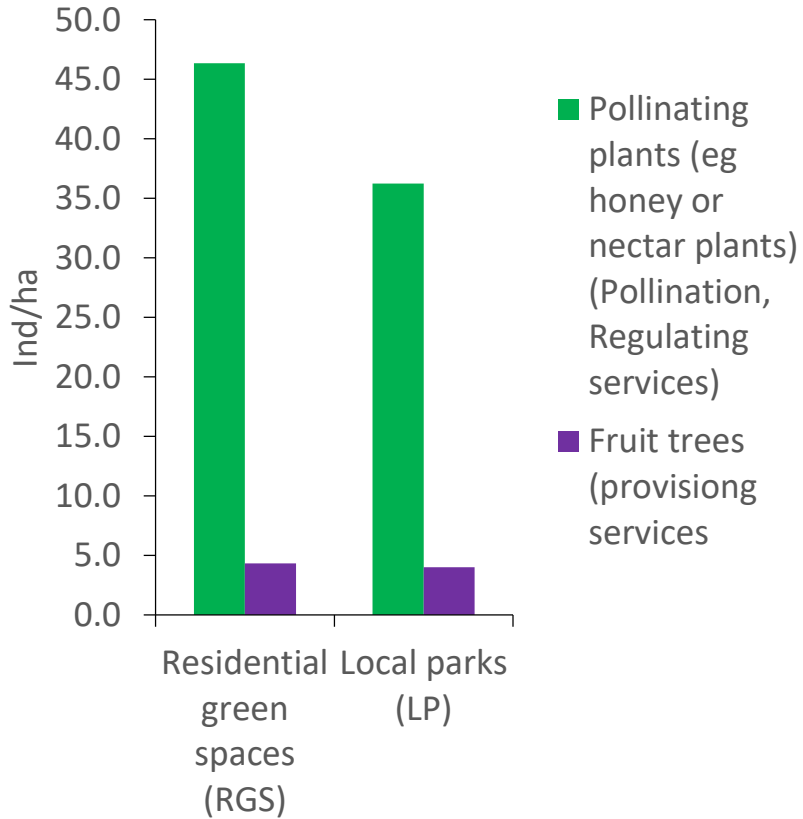


- Tendencias claras por tipología, con excepción de parques locales con poca y media vegetación

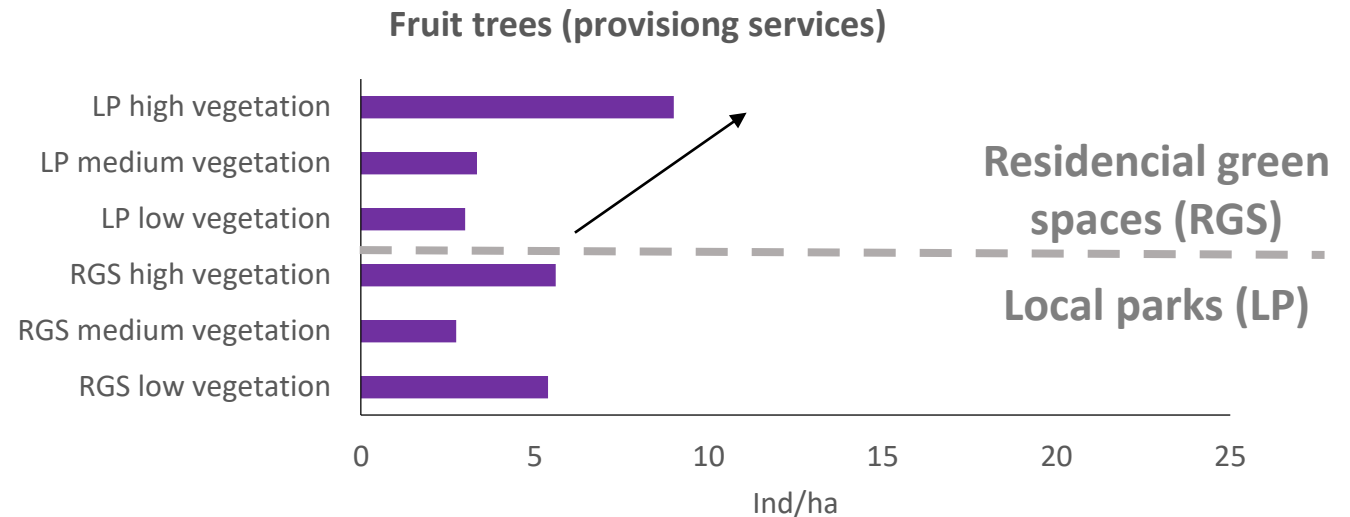
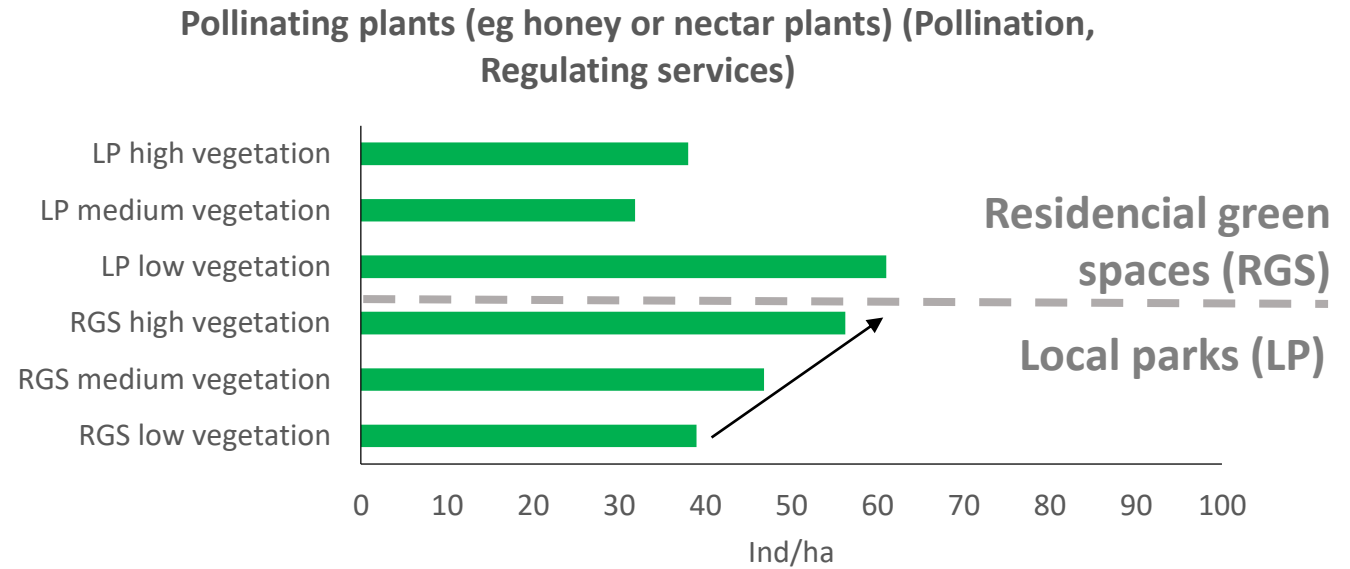




Plants able to produce ecosystem services are linked to local conditions



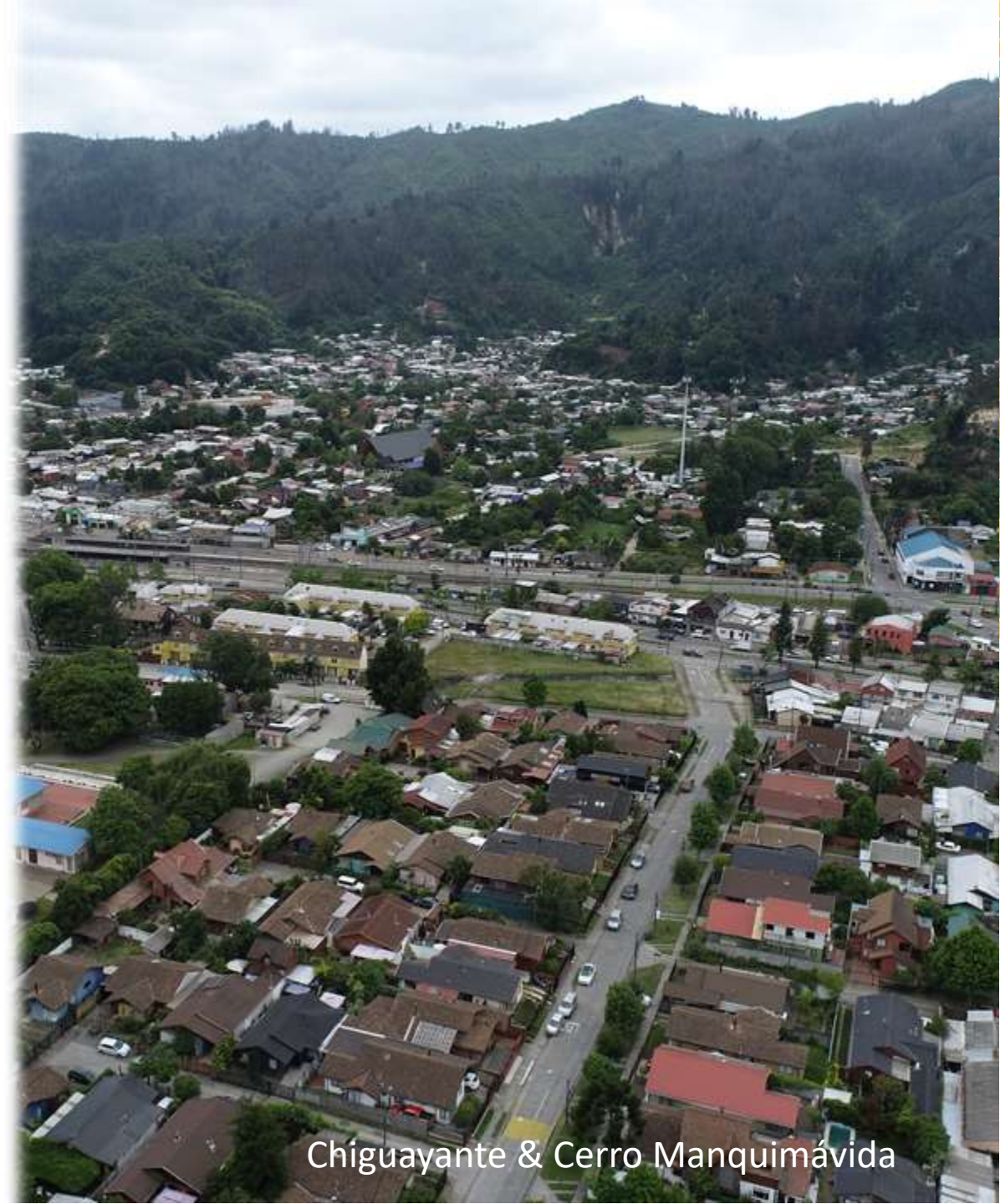
- Tipologías no explican cantidad de melíferas y frutales con total claridad.



Conclusiones y próximos pasos

- Muestreo (n=94) a través de técnicas de clusterización y técnicas de evaluación con expertos permiten proyectar resultados al universo de espacios verdes urbanos (N= 11.340),
- Medidas in-situ tienen a validar evaluación de expertos, con algunas excepciones asociadas a servicios ecosistémicos dependientes de selección de especies
- Patrones norte-sur poco claros-> producción socio-material de la naturaleza
- Cobertura vegetal y SE derivados de la biomasa se asocian con tipologías de EVU, no así aquellos asociados a composición de especies.
- En desarrollo:
 - Evaluación remota de otros servicios ecosistémicos
 - Vínculos con intereses y practicas sociales e institucionales en la producción de espacios verdes.

• +



Chiguayante & Cerro Manquimávida

2017

2021

Linking urban vegetation cover and effect on air temperature

2017

2021

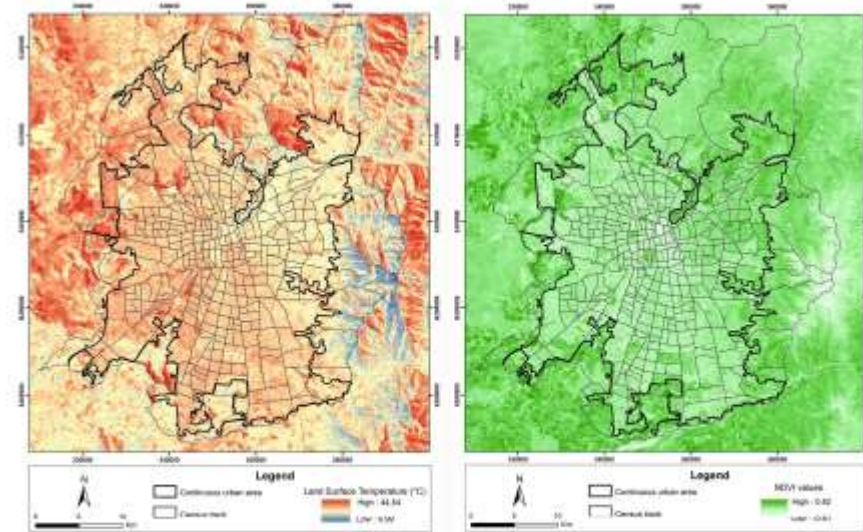


F. de la Barrera, C. Henríquez

Table 5

Change in vegetation cover. UC: urban core, NP: new peripheries.

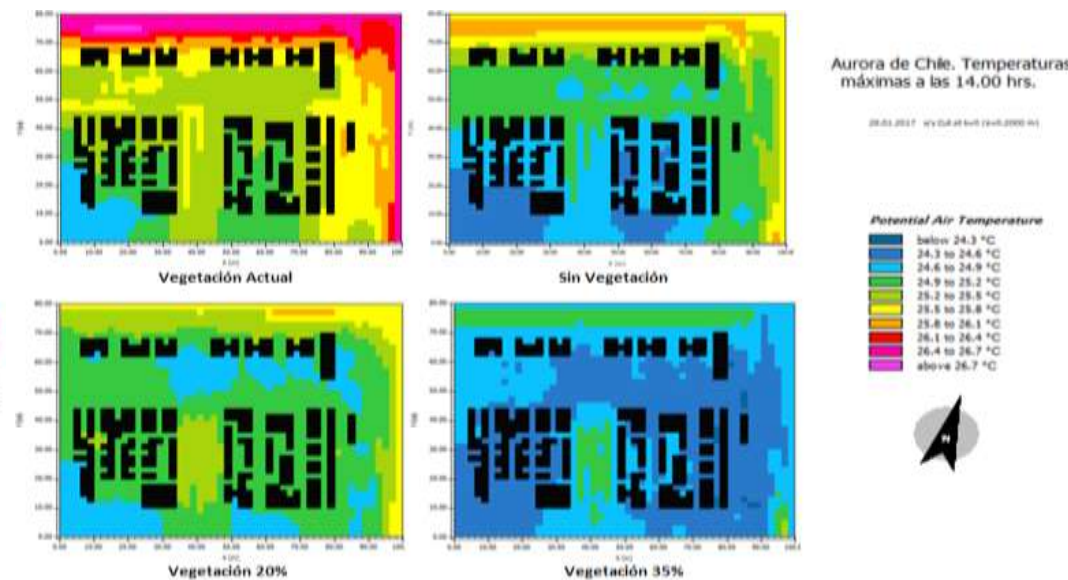
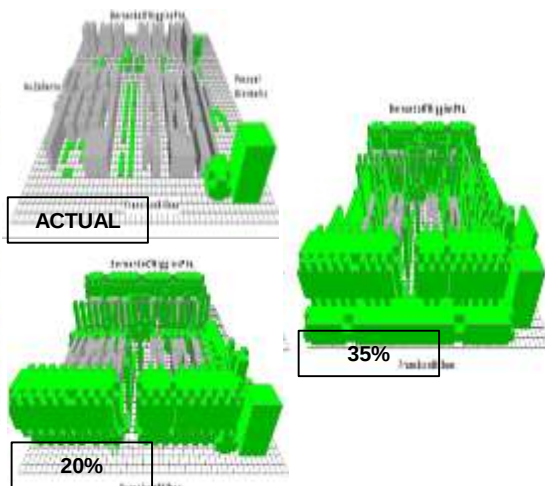
Sites	Vegetation cover
La Serena	
UC (T1)	2%
UC (T3)	1%
- UC change (T3-T1)	-1%
NP (T1)	16%
NP (T3)	5%
- NP change (T3-T1)	-11%
Santiago	
UC (T1)	5%
UC (T2)	6%
- UC change (T3-T1)	1%
NP (T1)	24%
NP (T3)	17%
- NP change (T3-T1)	-7%
Concepcion	
UC (T1)	3%
UC (T3)	3%
- Urban core change (T3-T1)	0%
NP (T1)	21%
NP (T3)	10%
- NP change (T3-T1)	-11%



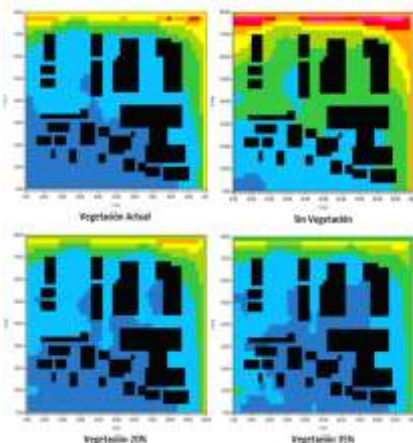
De la Barrera & Henríquez 2017. Ecological indicators.
Inostroza et al. 2016. PLOS One

Impacto de aumento de vegetación urbana

Población Aurora de Chile

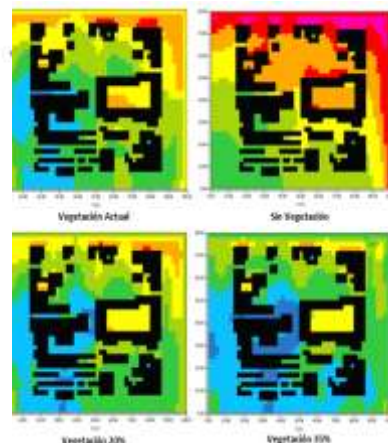


Víctor Lamas con Rengo



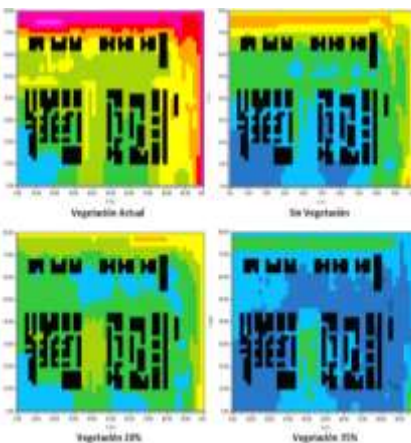
CV base = 10,6%
Si CV 35% = - 0,5 °C

Víctor Lamas con Salas



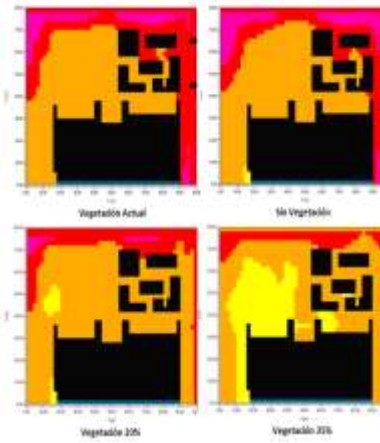
CV base = 5,1%
Si CV 35% = - 1 °C

Aurora de Chile



CV base = 8,3 %
Si CV 35% = - 0,8 °C

Prat con Av. los Carrera



CV base = 5,6 %
Si CV 35% = - 0,7 °C

Clasificación de la estructura de humedales

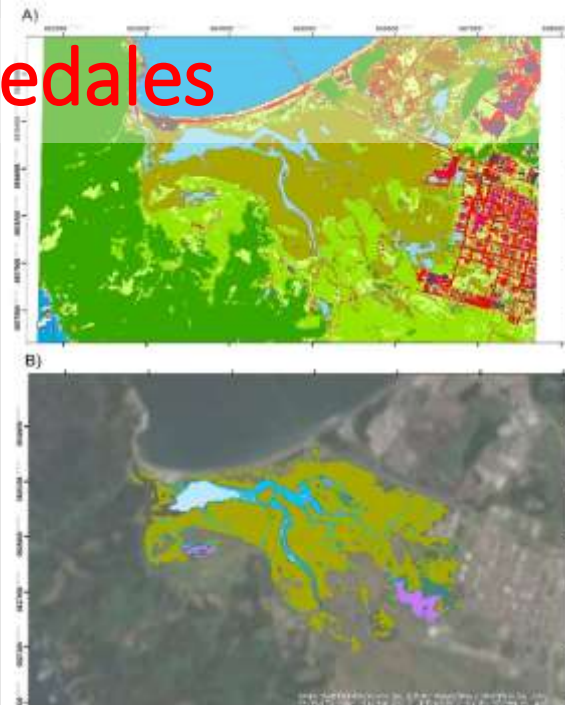
Enfoque por PIXEL



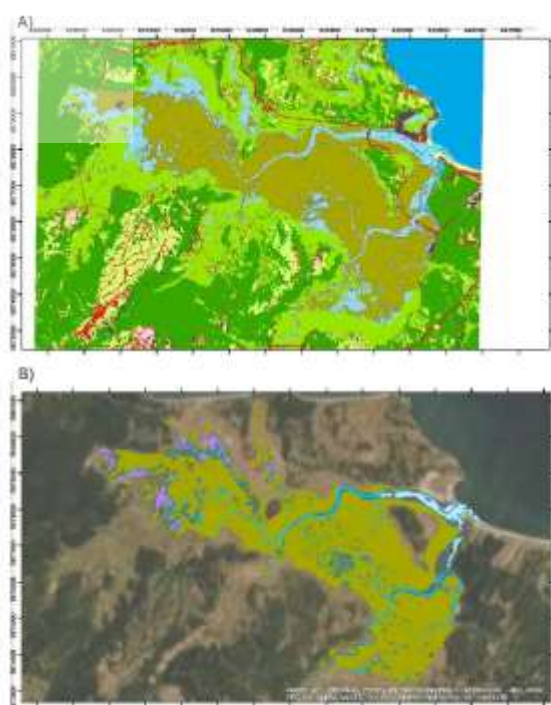
Humedal Rocuant-Andalén



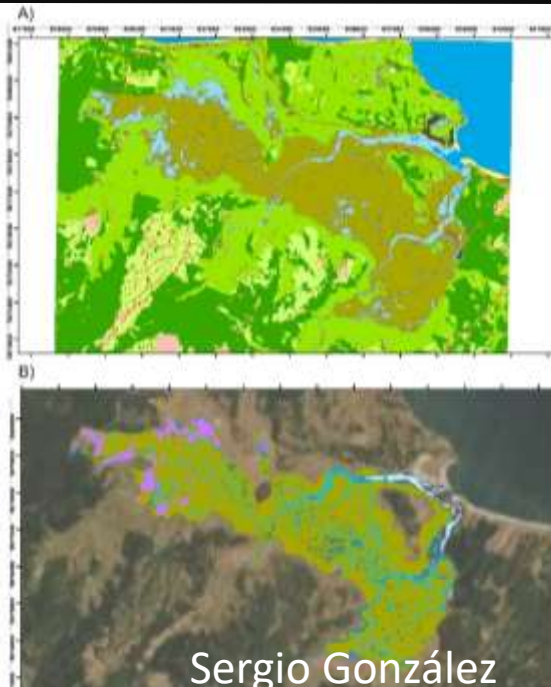
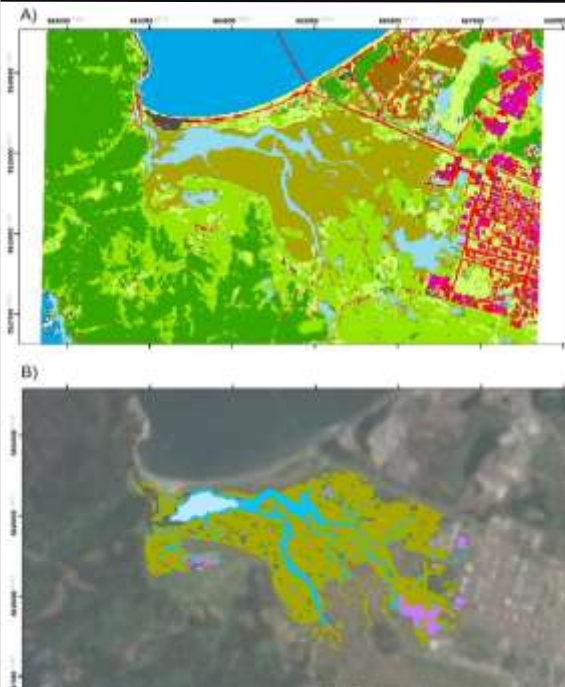
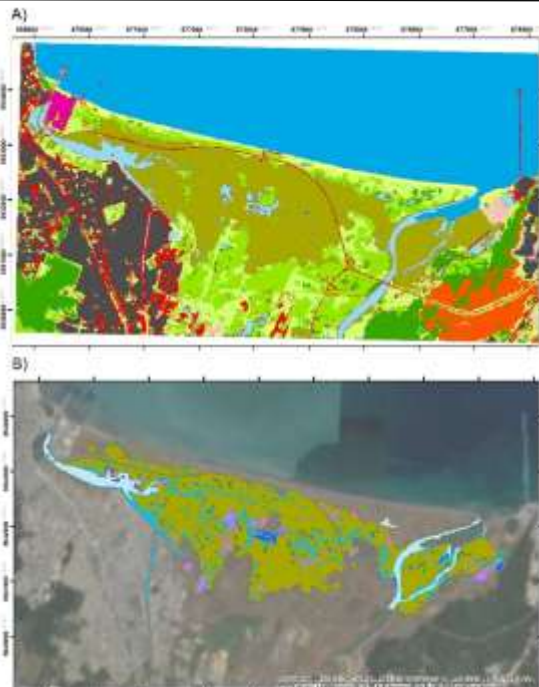
Humedal Lengua



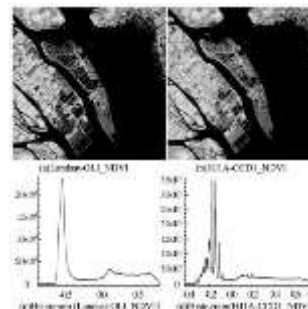
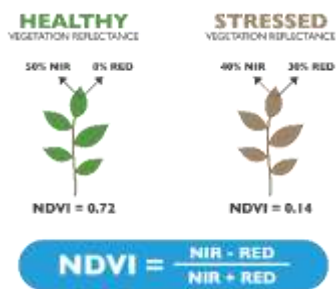
Humedal Tubul-Raqui



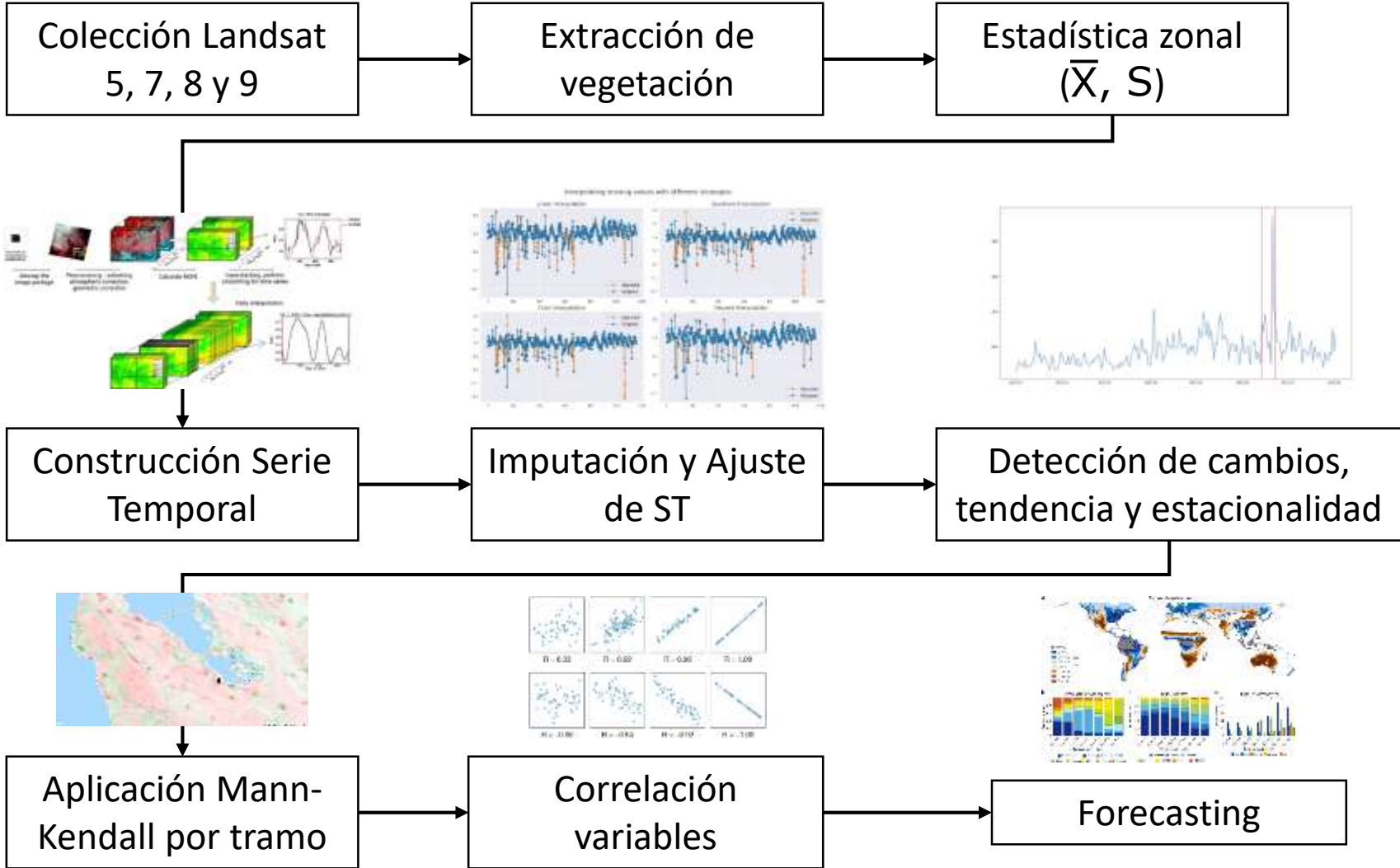
Enfoque por objeto (OBIA)



Sergio González



Tesis de doctorado en ciencias ambientales
 Juan Munizaga
 Director: Octavio Rojas





EDITORIAL article

Front. Sustain. Cities, 29 November 2022

Sec. Urban Greening

<https://doi.org/10.3389/frsc.2022.1101406>

This article is part of the Research Topic

Urban Greening for Ecosystem Services Provision: A Latin-American Outlook

[View all 6 Articles >](#)

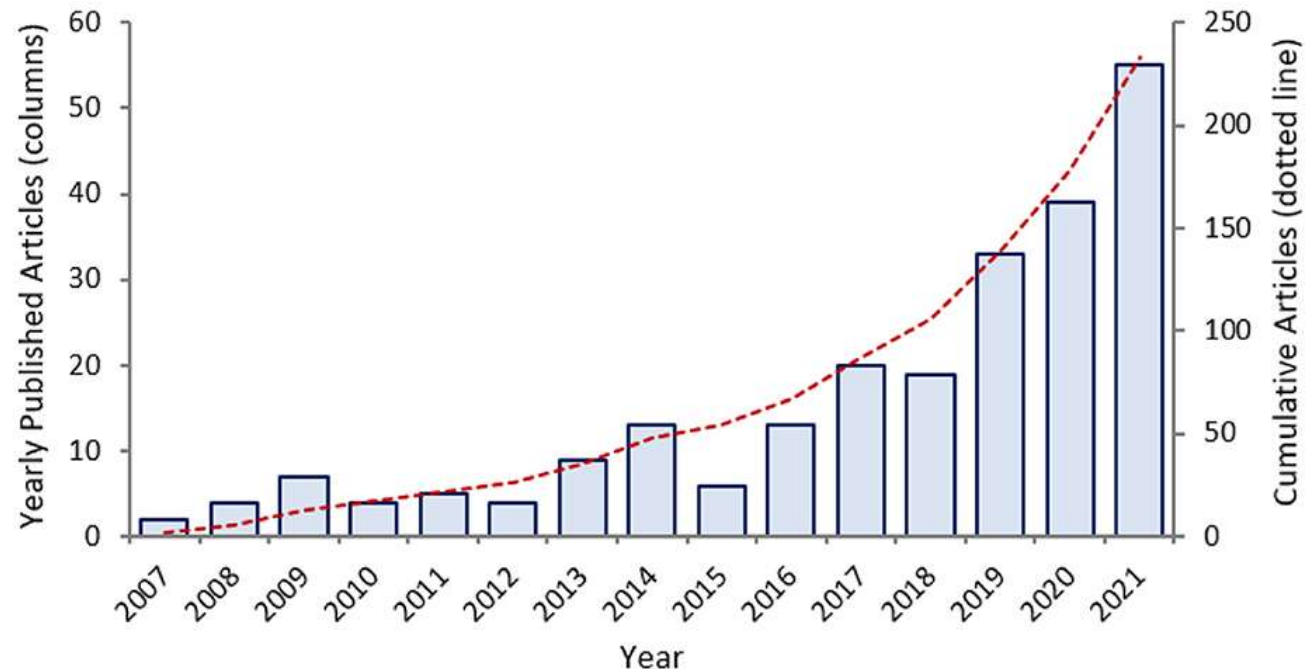
Editorial: Urban greening for ecosystem services provision: A Latin-American outlook

Ignacio C. Fernández^{1*},Cynnamon Dobbs^{2*} andFrancisco De la Barrera^{3*}¹ Centro de Modelación y Monitoreo de Ecosistemas, Facultad de Ciencias, Universidad Mayor, Santiago, Chile² Department of Natural Resources and the Environment, University of Connecticut, Storrs, CT, United States³ Facultad de Ciencias Ambientales (Eula) and Centro de Desarrollo Urbano Sustentable (CEDEUS), Universidad de Concepción, Concepción, Chile

Editorial on the Research Topic

Urban greening for ecosystem services provision: A Latin-American outlook

Planning for ecosystem services provisioning through urban greening is one of the key strategies to move toward more sustainable and resilient cities (Geneletti et al., 2020). While the last years have been prolific on urban ecosystem services research, the studies have been mainly focused on developed regions (Luederitz et al., 2015), leading to a gap in knowledge regarding the particularities of urban ecosystem services in highly-urbanizing regions, such as Latin America.



MEGAFIRES IN CHILE 2017 AND THE DIFFICULT RECOVERY OF THE LANDSCAPE AND ITS ECOSYSTEM SERVICES.

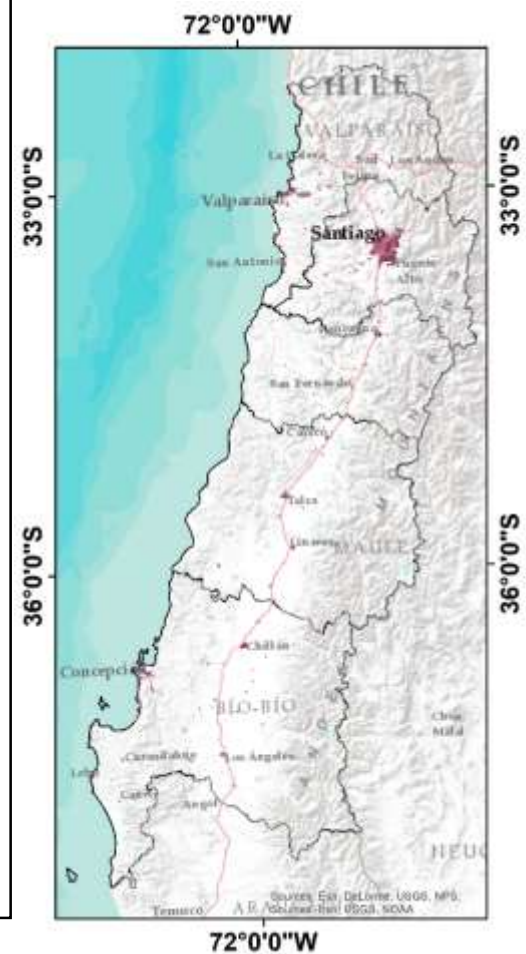
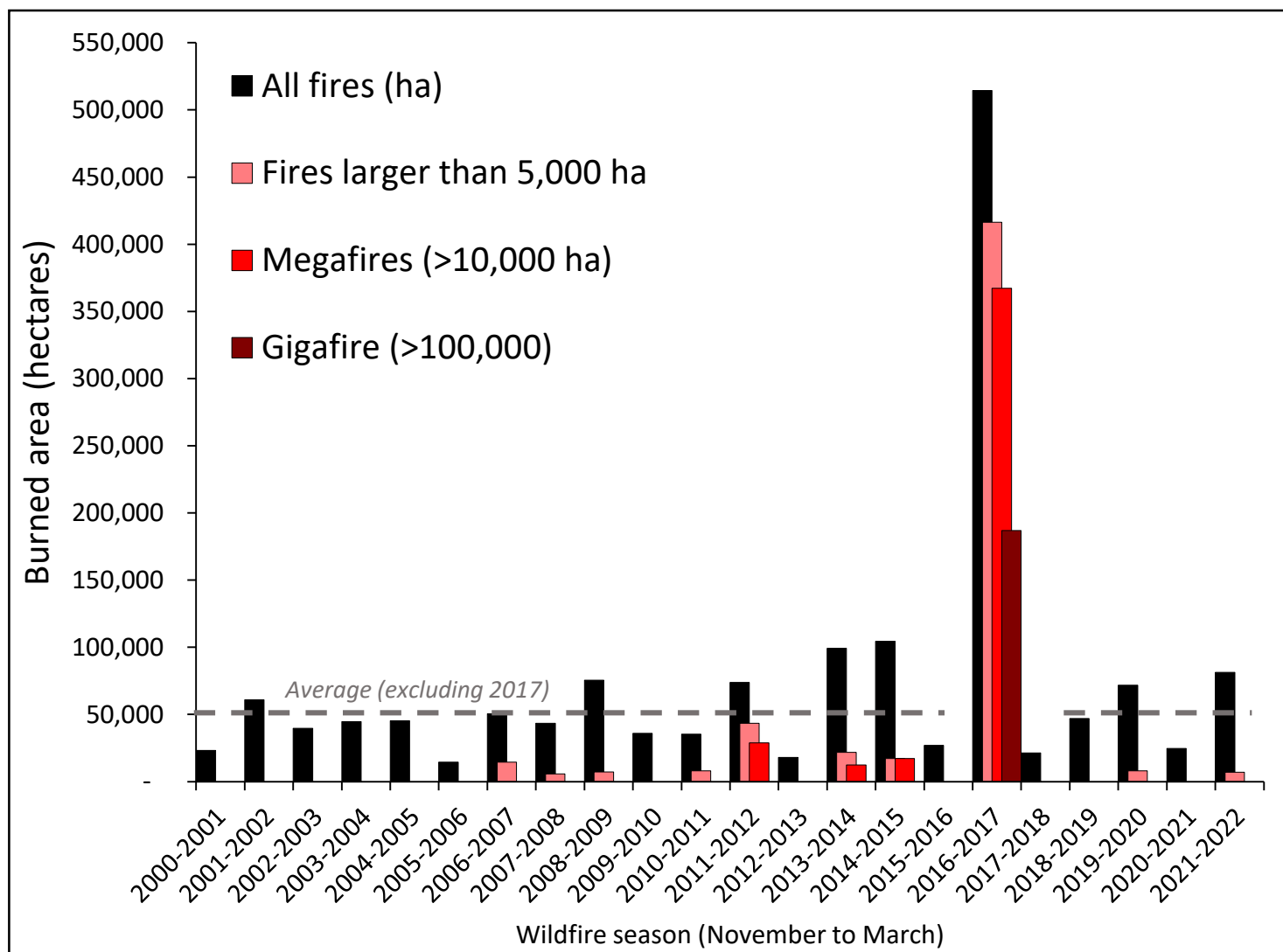


Grandes incendios forestales de Chile Centro-Sur y sus
efectos ambientales y urbanos en el periodo 2001-2021

ANID/Fondecyt N° 11190530

2019-2022

Megafires in Chile



Environmental and social effects of megafires en South-Central Chile

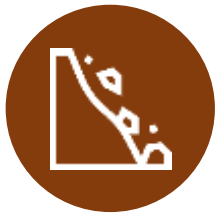


+ CO2 and PM2.5



+ runoff
+ sediment transportation
+ flooding risks

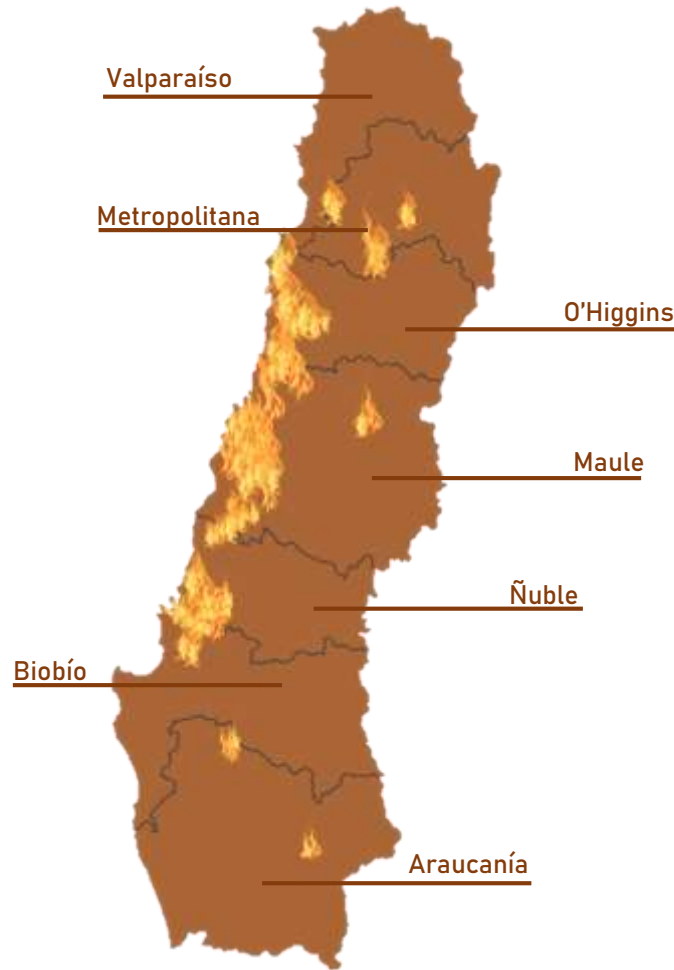
ENVIRONMENTAL EFFECTS



+ soil erosion
- vegetation cover
+ landslides risks



- natural vegetation
- habitat for endangered species
+ migration
+ invasion of exotic species
- ecological succession

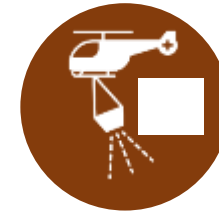


+ morbidity
and mortality



- households
- social identity
+ conflicts
+ migration

SOCIAL EFFECTS



+ emergency costs
- forestry productivity
- agriculture production



- mental health
+ trauma, stress,
depression

Fuente: Bowman et al. (2017); Castillo et al. (2003); CONAF (2017), De la Barrera et al. (2018); González et al. (2020); Quintanilla (2000); Úbeda & Sarricolea (2016).



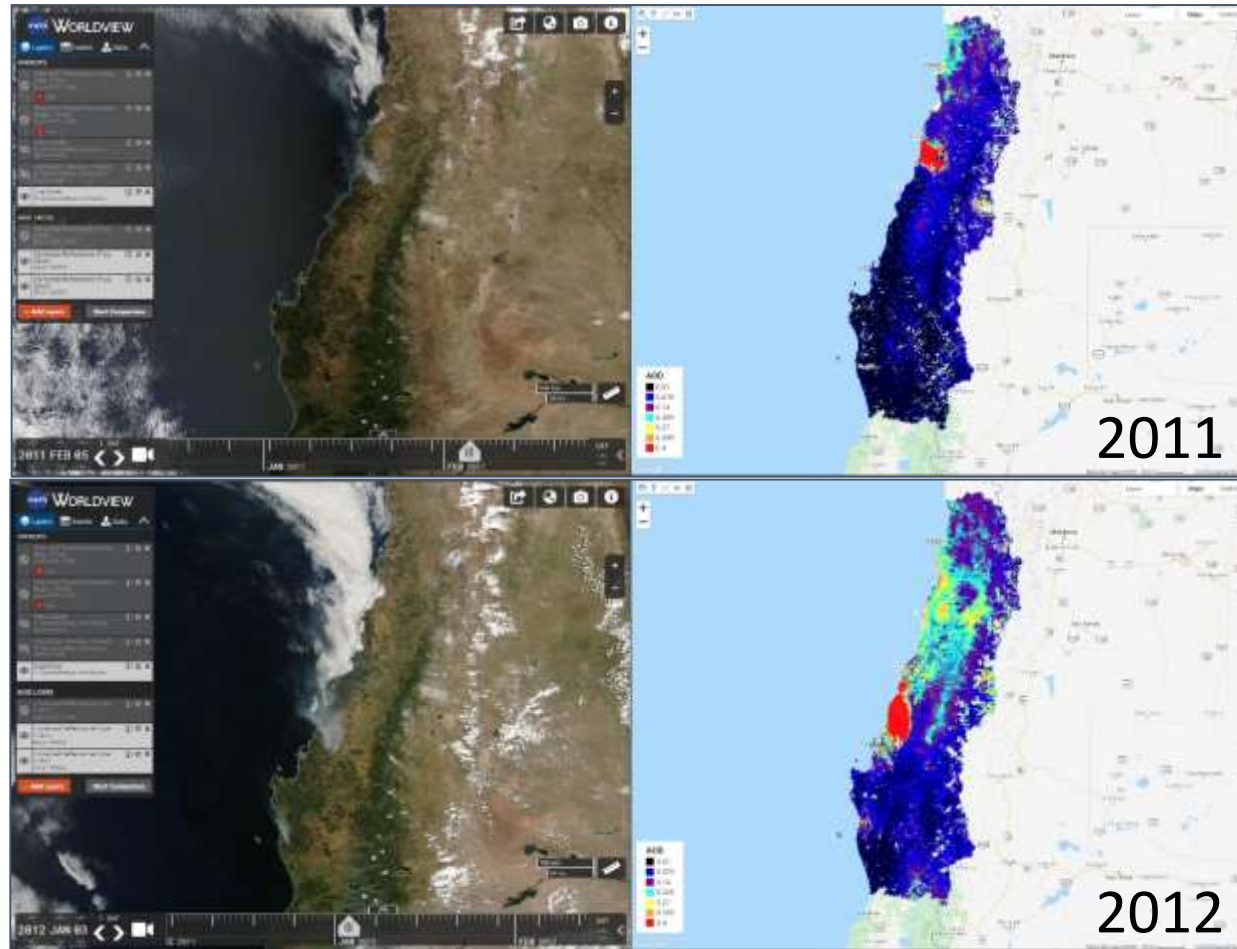
Megafires affect urban areas by loss of ecosystem services through air pollution (>100km). January 25-29, 2017 & February 14, 2019



Enero 2017

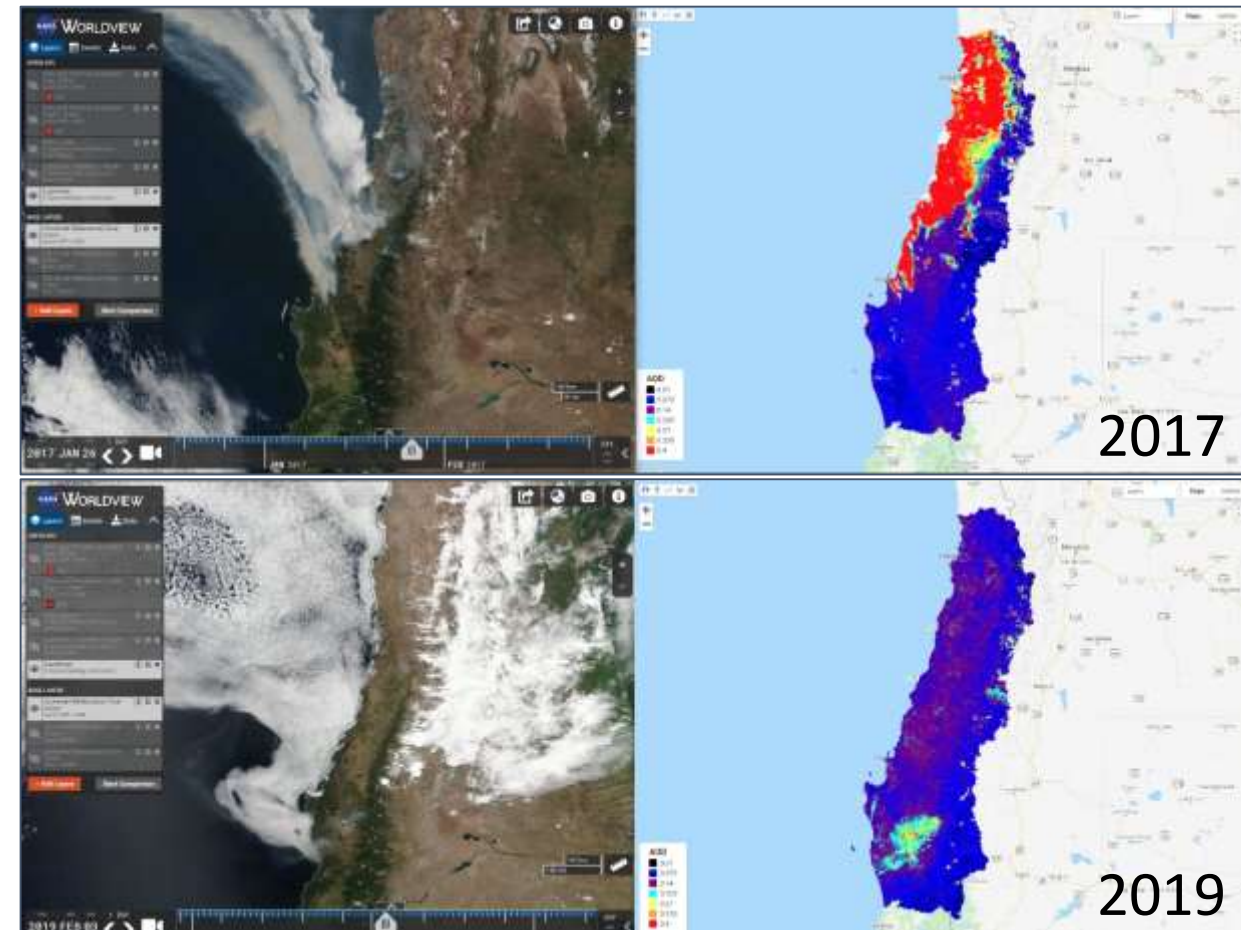
14 de febrero de 2019. Incendios en Cañete y Nacimiento (> 100 km de Concepción)

Megafires affecting urban areas by loss of ecosystem services



Imágenes en color verdadero
MODIS/Terra, Aqua/MODIS, y Suomi
NPP/VIIRS (Worldview)

AOD (profundidad óptica de aerosol)
MCD19A2_GRANULES (GEE MODIS)



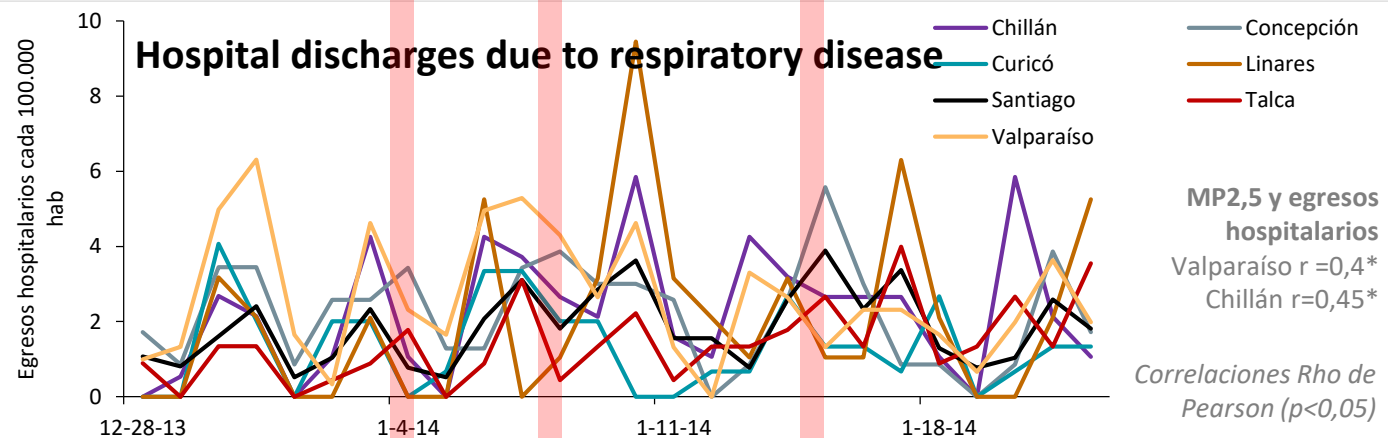
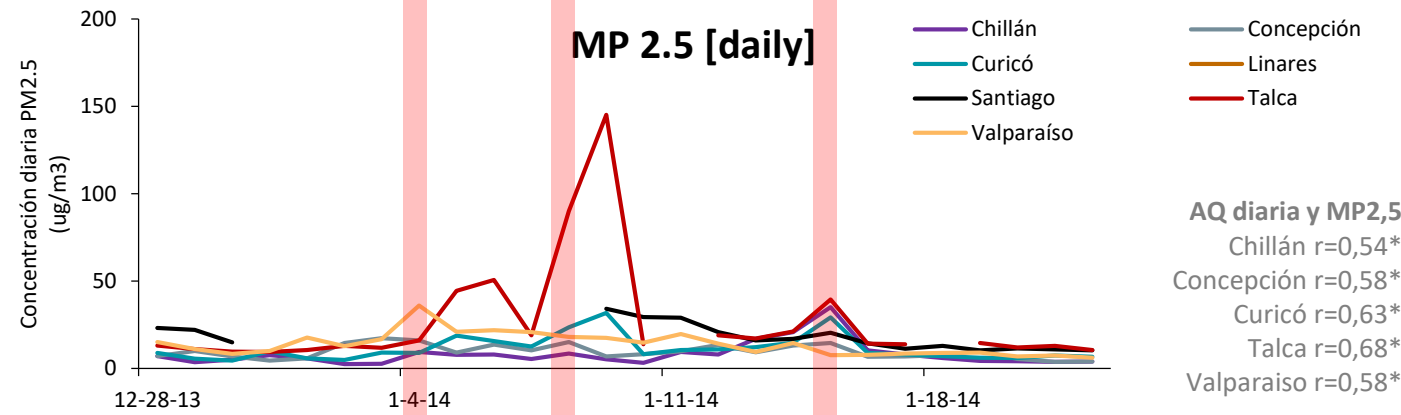
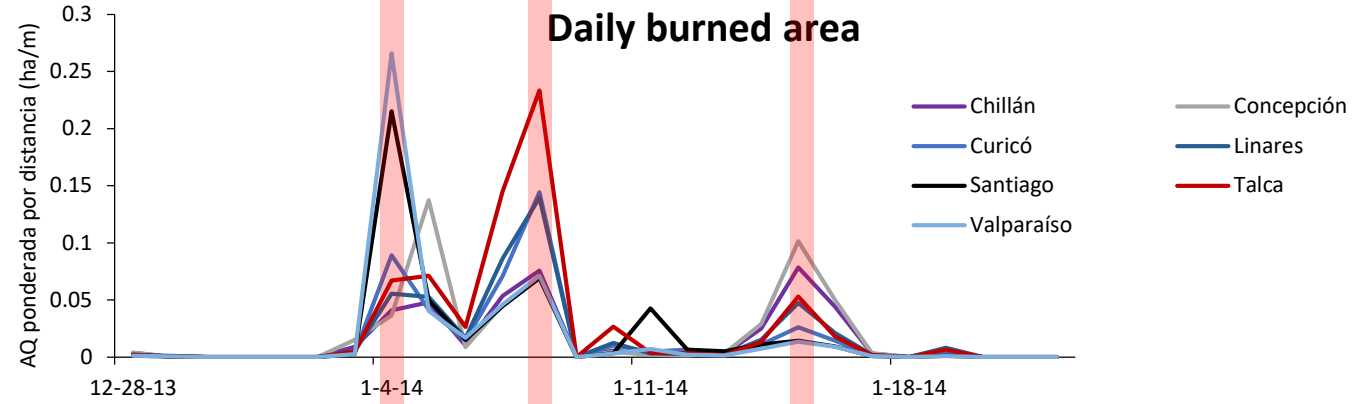
Megafires impact on Air quality and human health

Simbología

- Estaciones SIMCA
- Área quemada desde 02-01-2014 al 15-01-2014
- Comunas afectadas 02-01-2014 al 15-01-2014
- Área Estudio

Estación	Comuna
La Greda	Ruchuncavi
Indura	Talcahuano
ENAP Price	Hualde
Padre Las Casas II	Padre Las Casas
Las Encinas Temuco	Temuco
Nielol	Temuco
Cerro Nevía	Cerro Nevía
El Bosque	El Bosque
Independencia	Independencia
La Florida	La Florida
Las Condes	Las Condes
Pudahuel	Pudahuel
Puente Alto	Puente Alto
Parque O'Higgins	Santiago
Talagante	Talagante
Los Maitenes	Ruchuncavi
Ventanas	Ruchuncavi
Valparaíso	Valparaíso
Rancagua II	Rancagua
Curicó	Curicó
Linares	Linares
U.C. Maule	Talca
La Florida	Talca
Universidad de Talca	Talca
Kingston College	Concepción
Nueva Libertad	Talcahuano

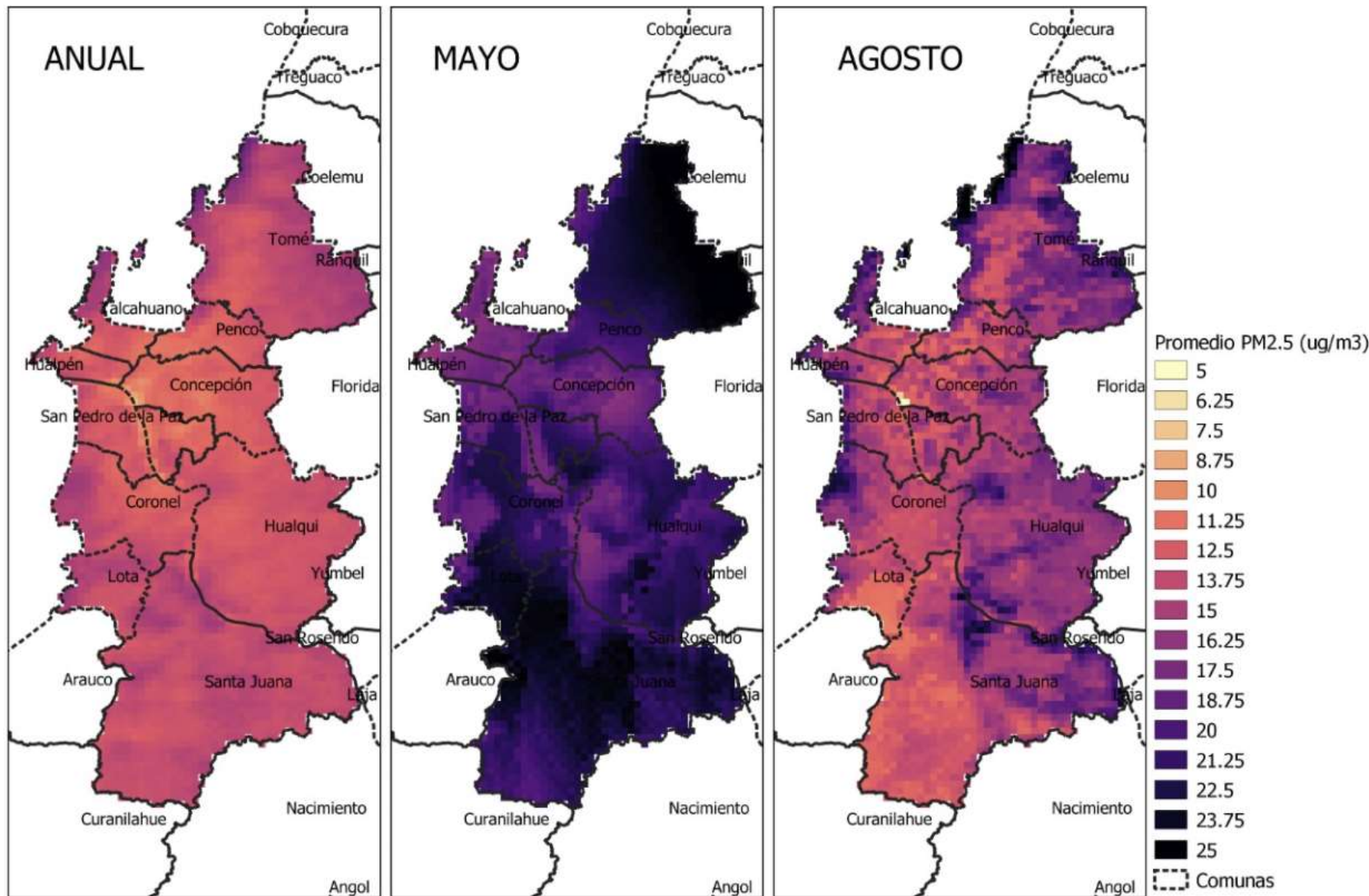
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri



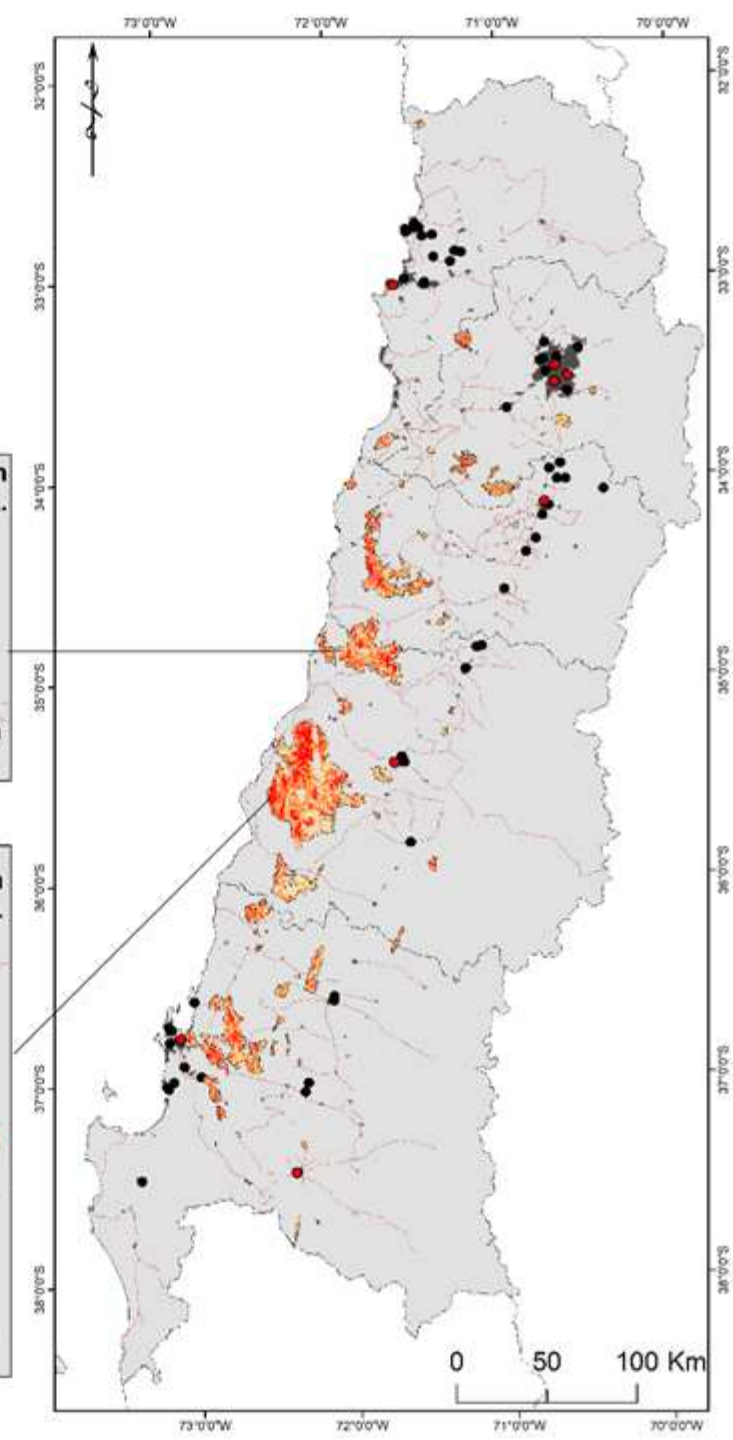
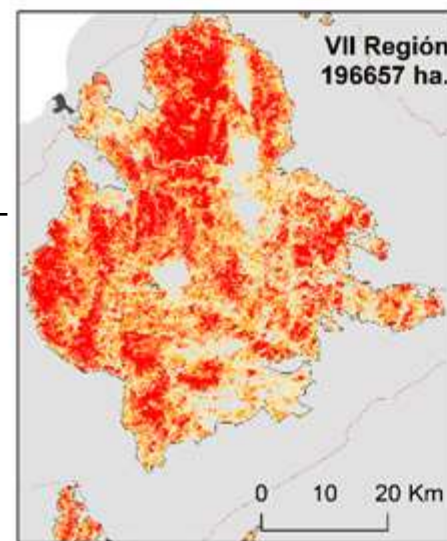
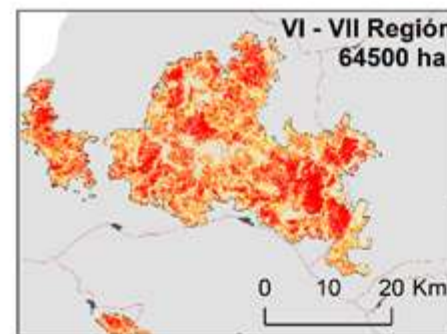
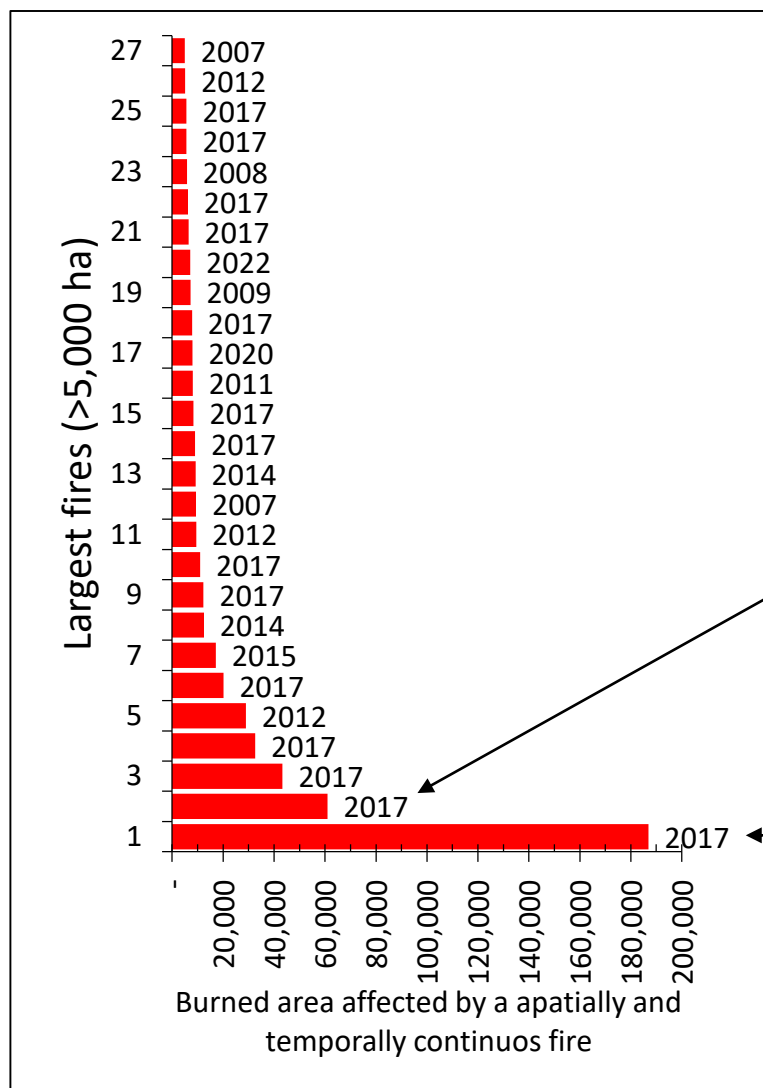
Next:
exploring air
quality data
derived from
satellites

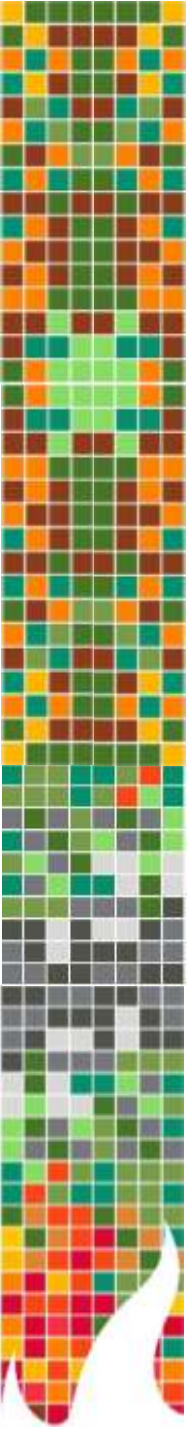
Surface PM2.5
[V5.GL.03](#)

SO2 & NO2
[S5P/TROPOMI](#)



Studying single megafires (2017)

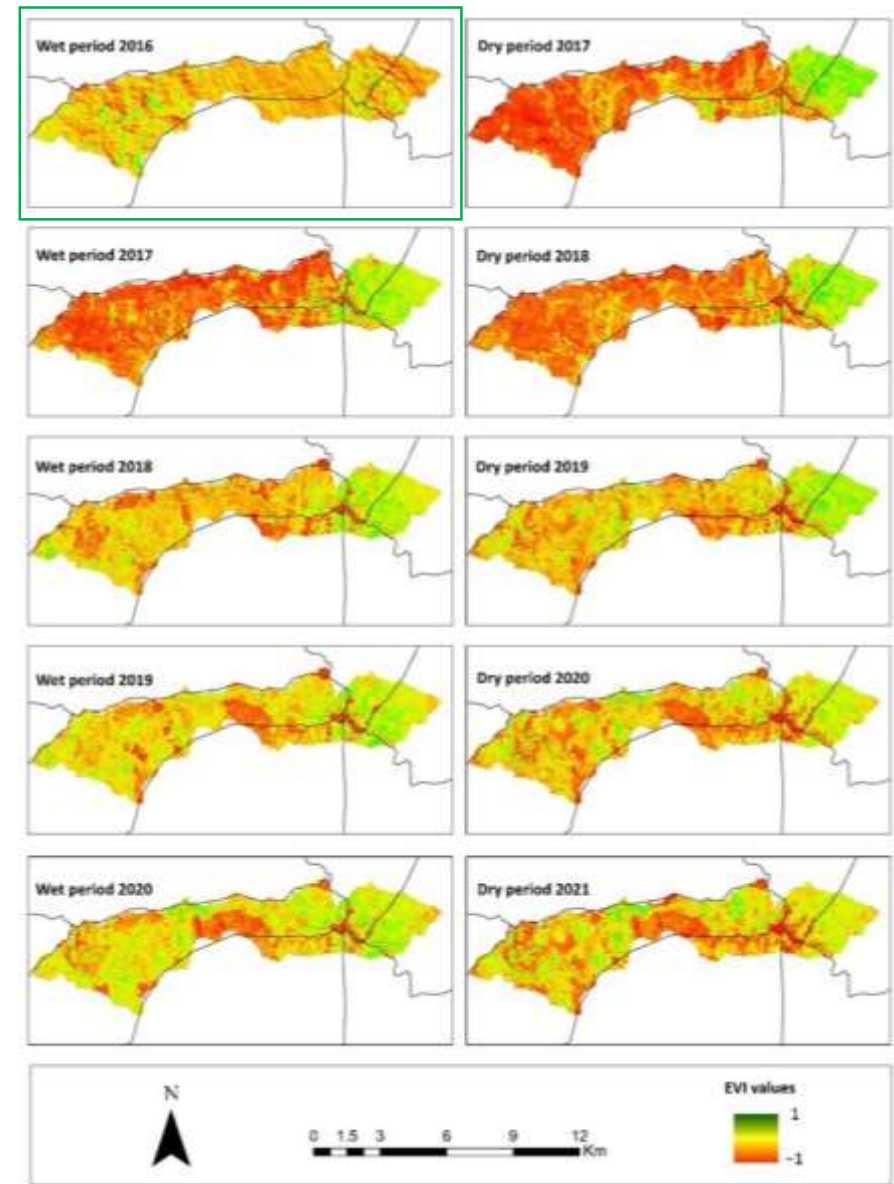
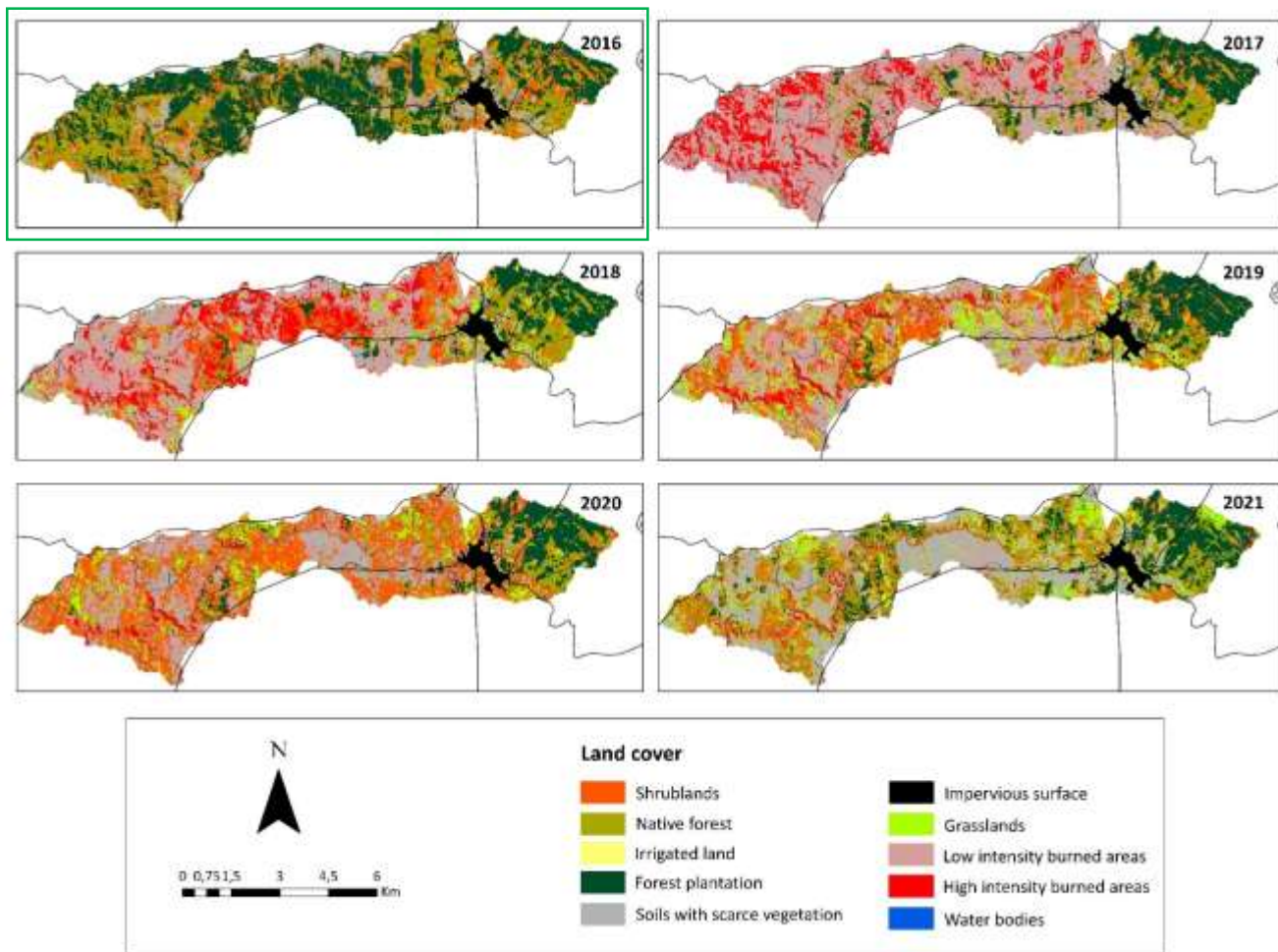




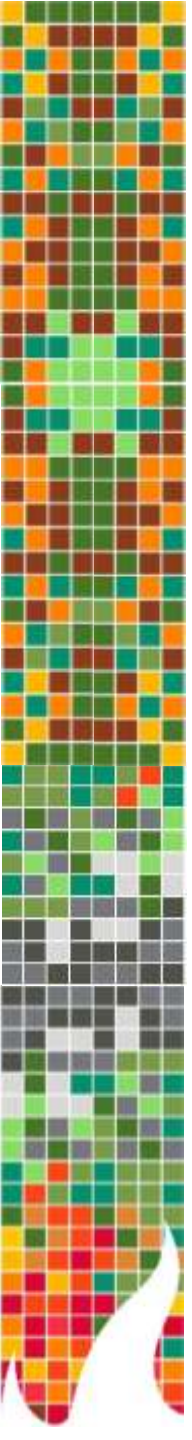
Methods

- How landscape changes
 - Mapping through annual land cover classifications and monthly spectral indices over 6 years.
 - Sentinel-2 images, Random forest, Google Earth Engine
 - All bands + spectral indices: NBRI, NDVI, NDWI, BI2
- The expert-based matrix of ecosystem services
 - 0-5 capacity of ES provision
 - All services, 15 experts
 - Control of soil erosion and runoff ES
- Spatially explicit models for soil erosion and run-off control, as regulation services
 - RUSLE and
 - OpenNSPECT

Dynamic landscape in a single watershed: Land cover and EVI



Mancilla-Ruiz, D., De la Barrera, F., González, S., & Huaico, A. 2021. The Effects of a Megafire on Ecosystem Services and the Pace of Landscape Recovery. *Land*, 10(12), 1388.



Mean values NDVI and EVI



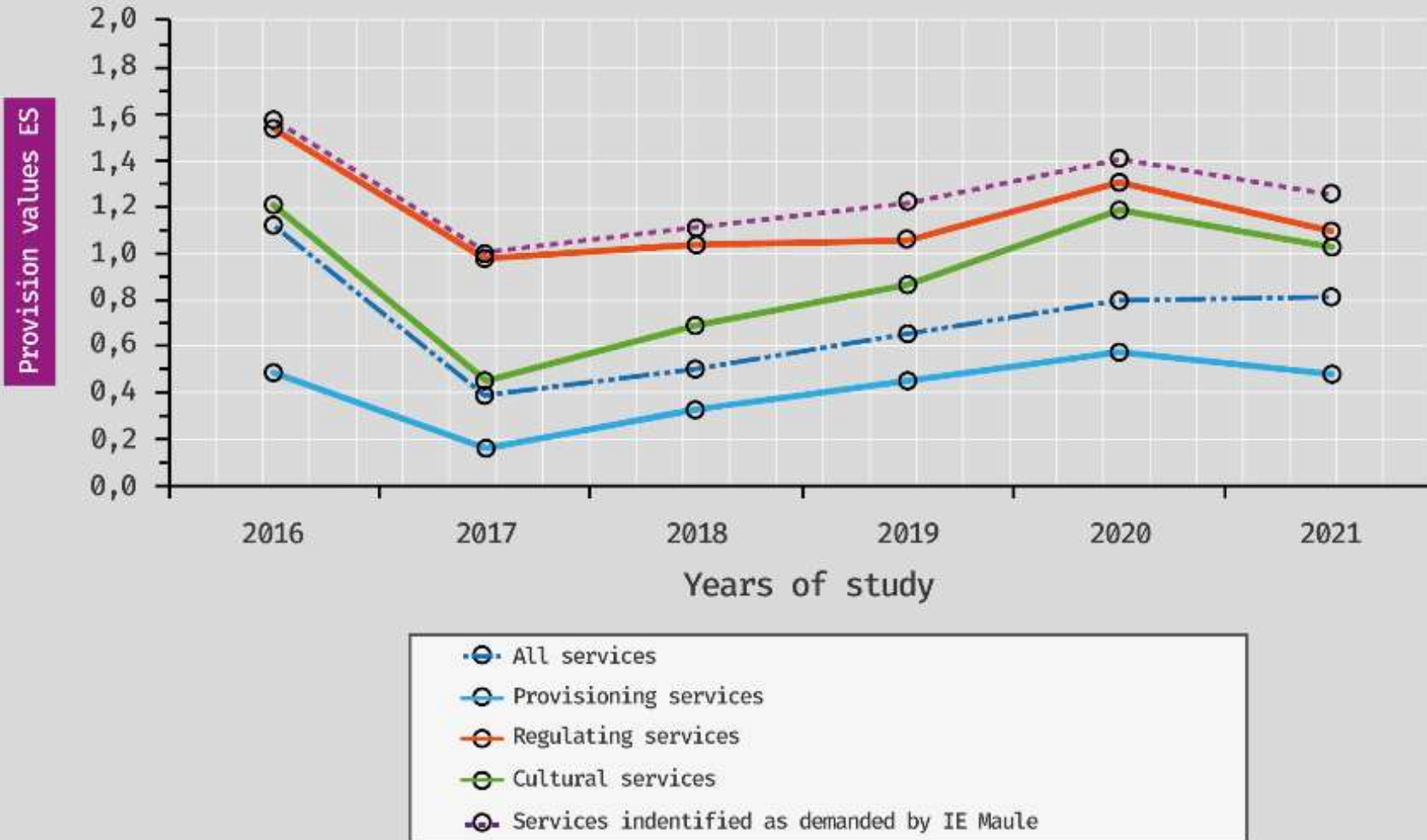
Vegetation
index:
NDVI & EVI

From landscape changes to ecosystem services provision

	Ecosystems										Ecosystem Services Provision (ESP)					
	IL	WB	GR		SH	NF	FP	HB	LB	LV						
PLAND ecosystems 2016	0%	1%	4%	3%	19%	26%	38%	0%	1%	10%						
PLAND ecosystems 2017	0%	1%	1%	3%	3%	12%	11%	15%	45%	10%						
PLAND ecosystems 2018	0%	1%	7%	4%	18%	8%	9%	13%	34%	7%						
PLAND ecosystems 2019	0%	1%	15%	4%	22%	8%	11%	6%	26%	8%						
PLAND ecosystems 2020	0%	1%	9%	4%	35%	13%	10%	4%	13%	13%						
PLAND ecosystems 2021	0%	1%	15%	3%	14%	19%	15%	2%	0%	9%						
	Capacity of ecosystems to supply ecosystem services										2016	2017	2018	2019	2020	2021
All ecosystem services (ES)	0	1	1	0	1	2	1	0	0	0	1.1	0.4	0.5	0.6	0.8	0.8
Provisioning ES	1	1	1	0	1	1	0	0	0	0	0.5	0.2	0.3	0.5	0.6	0.5
Regulating ES (all)	0	1	0	0	2	3	1	0	1	0	1.5	1	1	1.1	1.3	1.1
Regulating ES (only biotic services)	1	1	1	0	2	3	1	0	1	0	1.6	1	1.1	1.2	1.4	1.2
Cutural ES	0	4	1	0	2	3	0	0	0	0	1.2	0.4	0.7	0.9	1.2	1.0
ES most demanded by the population of the Maule Region	1	2	1	0	2	3	1	0	1	0	1.6	1	1.1	1.2	1.4	1.2

From landscape changes to ecosystem services provision

	Ecosystems										Ecosystem Services Provision (ESP)					
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PLAND ecosystems 2018	0%	1%	7%	4%	18%	8%	9%	13%	34%	7%						
PLAND ecosystems 2019	0%	1%	15%	4%	22%	8%	11%	6%	26%	8%						
PLAND ecosystems 2020	0%	1%	9%	4%	35%	13%	10%	4%	13%	13%						
PLAND ecosystems 2021	0%	1%	15%	3%	14%	19%	15%	2%	0%	9%						
	Capacity of ecosystems to supply ecosystem services										2016	2017	2018	2019	2020	2021
All ecosystem services (ES)	0	1	1	0	1	2	1	0	0	0	1.1	0.4	0.5	0.6	0.8	0.8
Provisioning ES	1	1	1	0	1	1	0	0	0	0	0.5	0.2	0.3	0.5	0.6	0.5
Regulating ES (all)	0	1	0	0	2	3	1	0	1	0	1.5	1	1	1.1	1.3	1.1
Regulating ES (only biotic services)	1	1	1	0	2	3	1	0	1	0	1.6	1	1.1	1.2	1.4	1.2
Cutural ES	0	4	1	0	2	3	0	0	0	0	1.2	0.4	0.7	0.9	1.2	1.0
ES most demanded by the population of the Maule Region	1	2	1	0	2	3	1	0	1	0	1.6	1	1.1	1.2	1.4	1.2

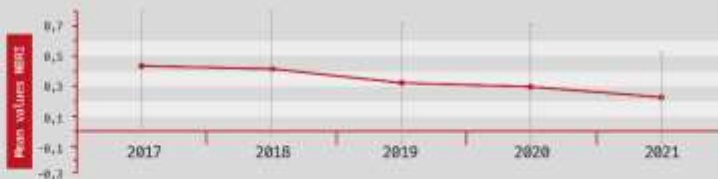
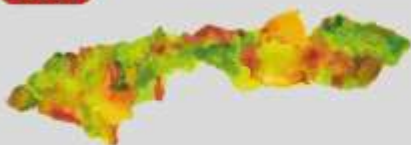


Provision of ecosystem services

Mancilla-Ruiz, D., De la Barrera, F., González, S., & Huaico, A. 2021. The Effects of a Megafire on Ecosystem Services and the Pace of Landscape Recovery. Land, 10(12), 1388.



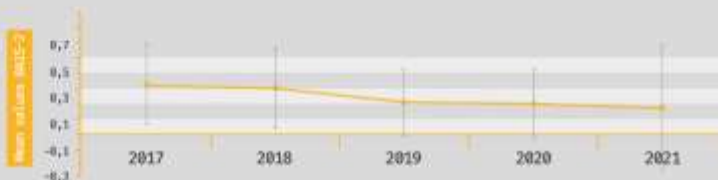
2016



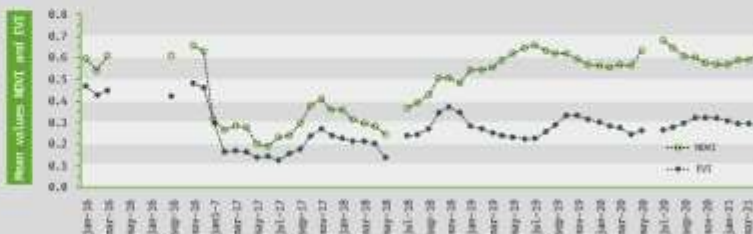
Effects on:

Fire severity
index: NBRI &
BAIS-2

2017

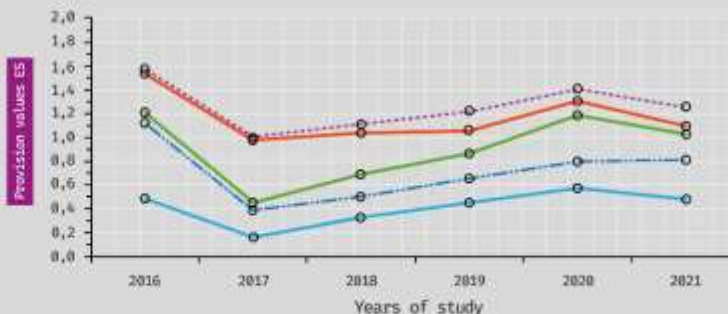


2018



Vegetation
index:
NDVI & EVI

2019



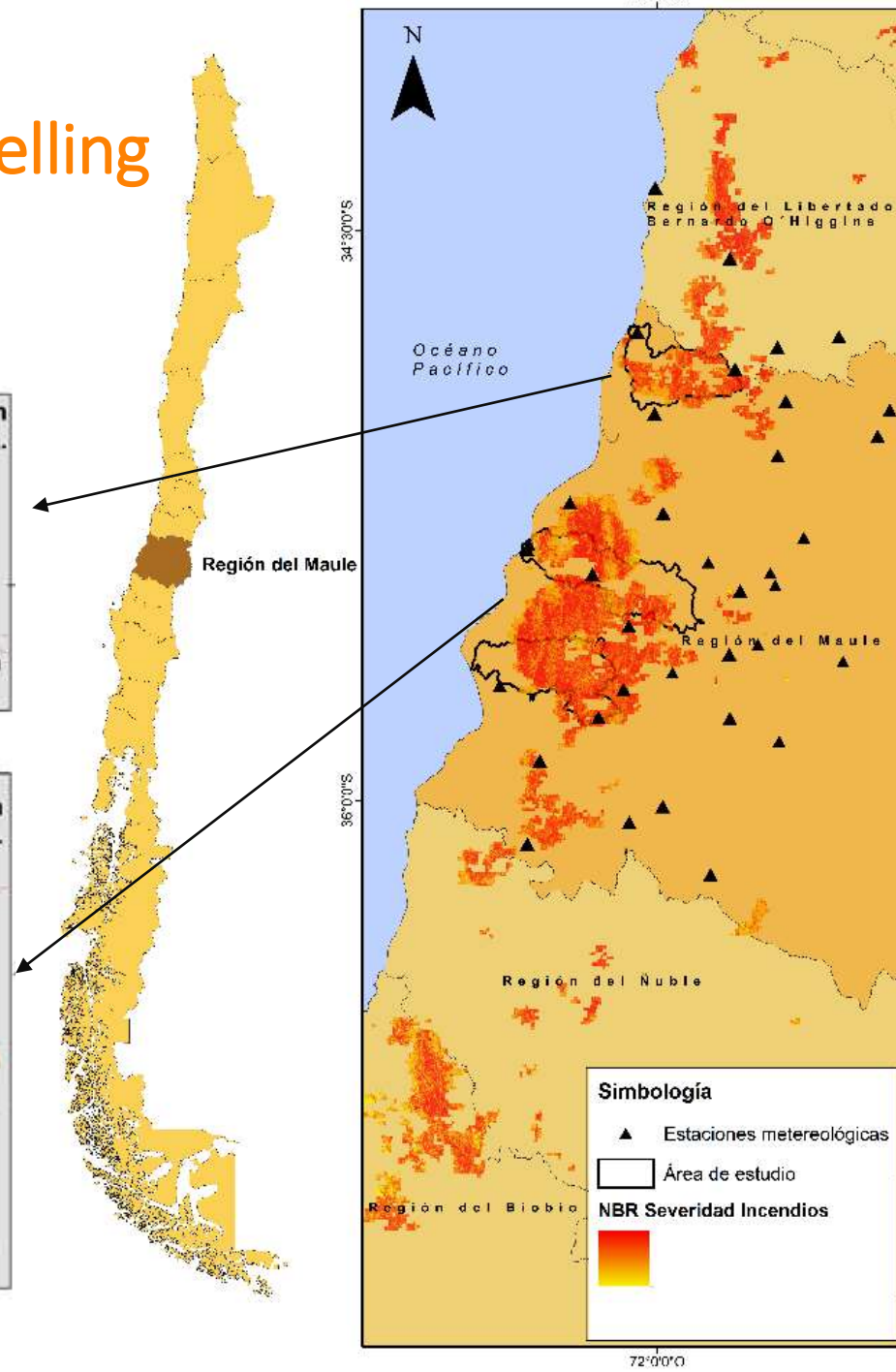
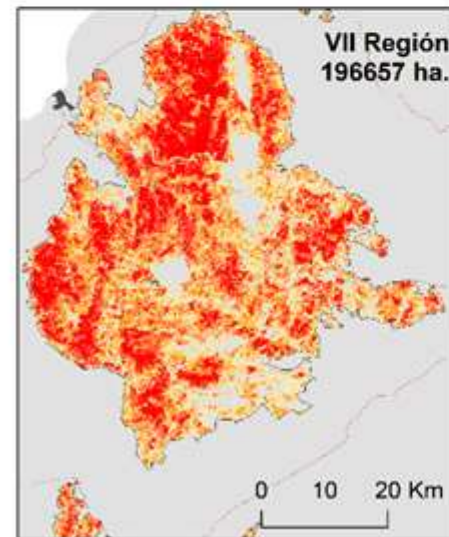
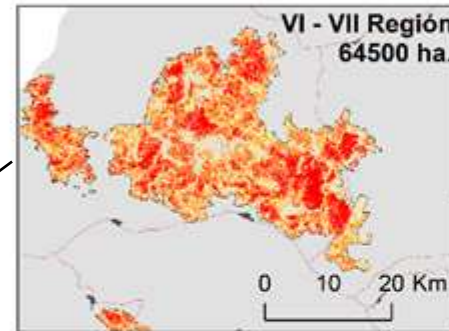
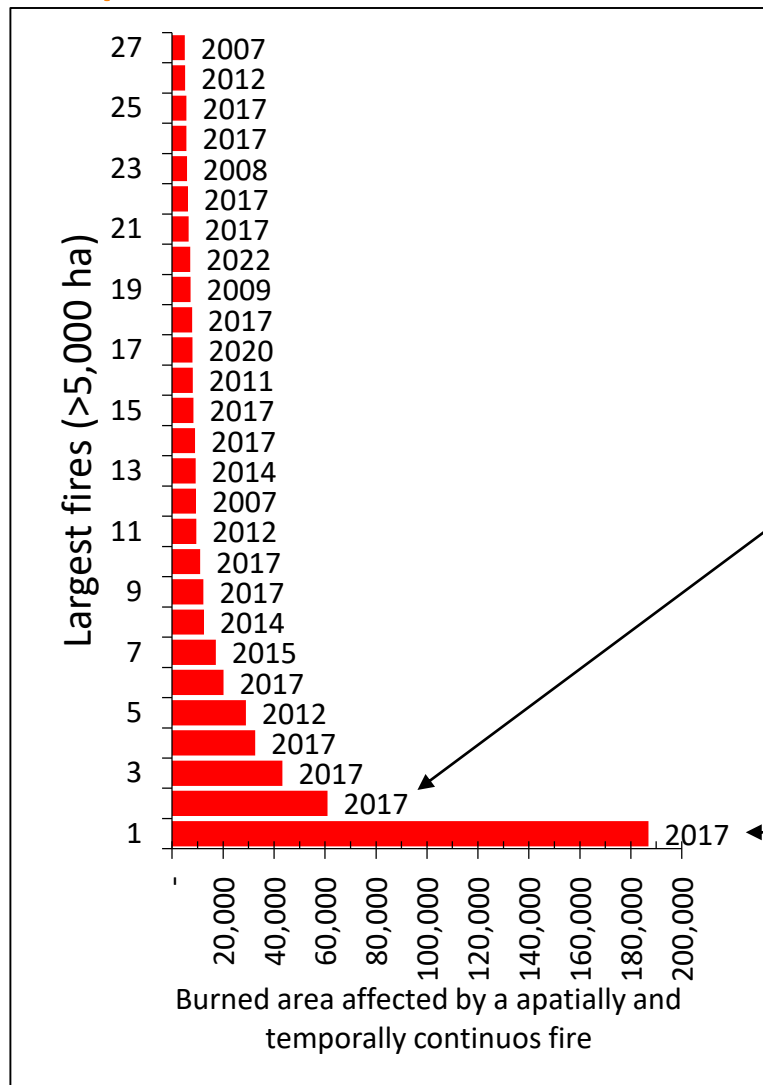
Provision of
ecosystem
services

2020

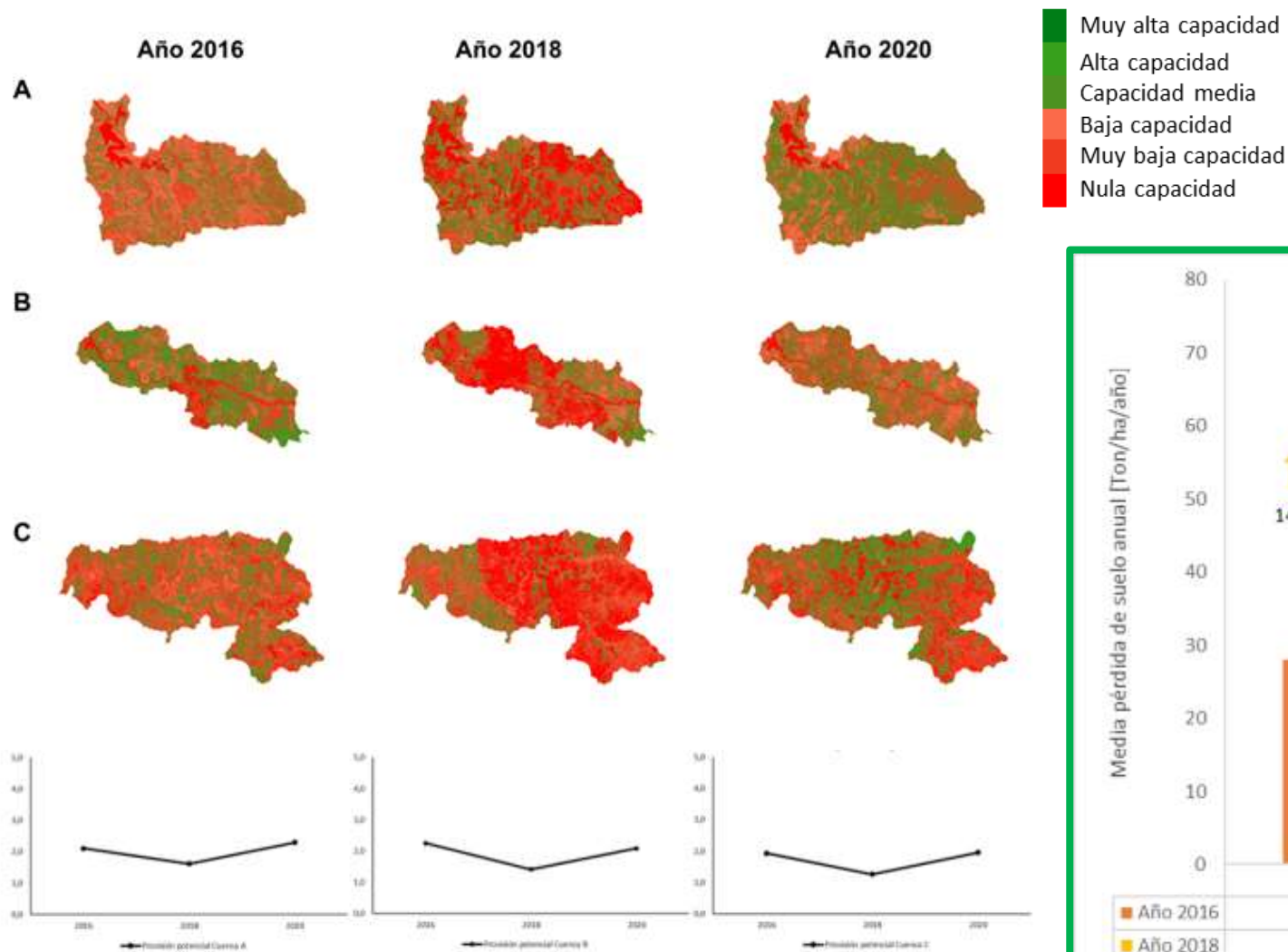


Mancilla-Ruiz, D., De la Barrera, F., González, S., & Huaico, A. 2021. The Effects of a Megafire on Ecosystem Services and the Pace of Landscape Recovery. Land, 10(12), 1388.

Studying single megafires: expert-based matrix + remote sensing & modelling

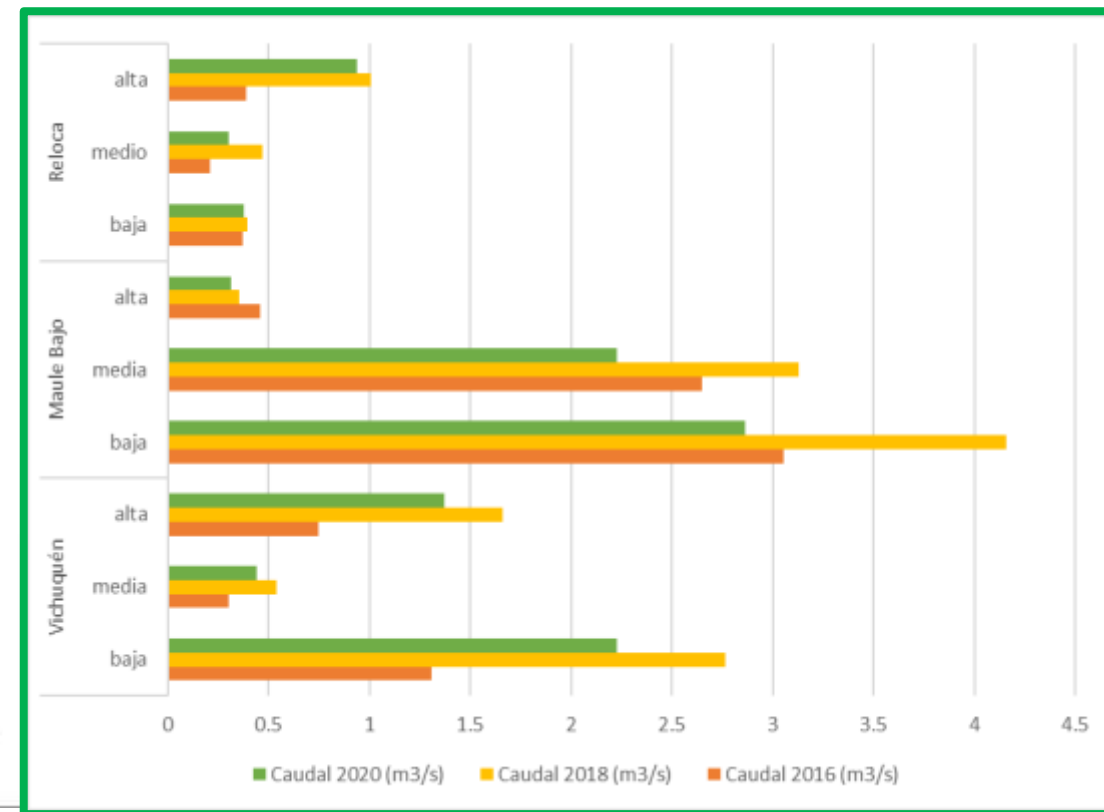
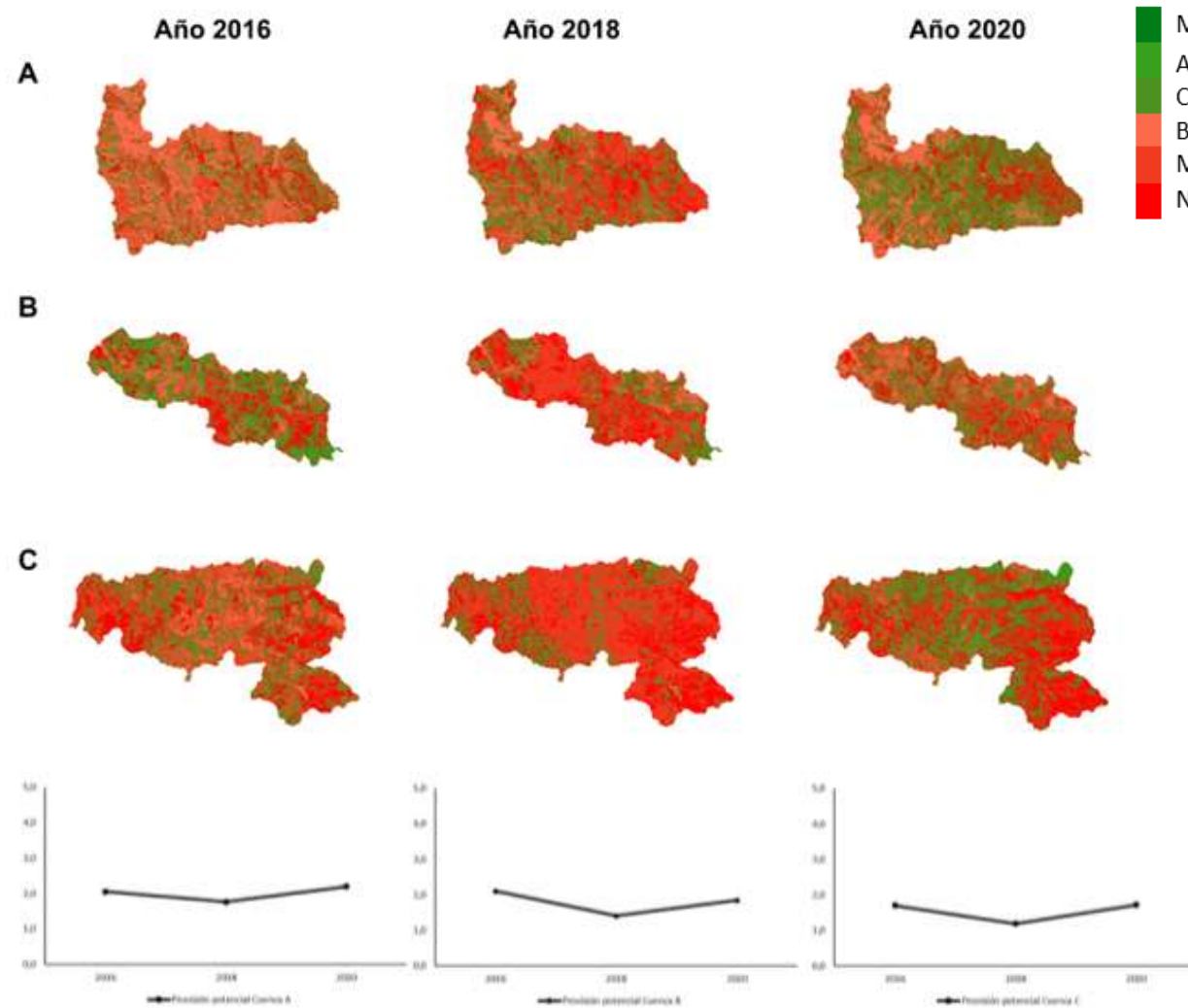


Soil erosion control based on expert valuation & modelling



Annual loss of soil: erosion [Ton/ha*year]

Run-off control based on expert valuation & modelling



time

River flow (*caudal*) [m³/s]

Conclusiones y próximos pasos

- Evidenciar el efecto de megaincendios
 - Impulsa acciones para actuar para evitar megaincendios (antes, durante y después)
 - Inspira acciones de restauración/reparación para evitar perpetuación de pérdida de servicios ecosistémicos
- Recuperación de servicios ecosistémicos post-incendios, require de planificación y monitoreo.
- Métodos basados en consulta a expertos + teledetección muestra recuperación más veloz que métodos basados en modelos.



Final remarks and challenges

- Landscape ecology and ecological planning approach and goals
 - Future (better) landscapes: protecting and restoring
 - Economy, human wellbeing and/or ethics.
- Research on urban ecosystems dynamics and their ecosystem services
 - Enriching typologies of urban green spaces and their indicators
 - Improving techniques to evaluate ecosystem services combining approaches
 - Going deeper in socio-material production of nature within cities*
- Research on monitoring of megafires and their effects on landscape and ecosystem services
 - Acknowledge large landscape effects of megafires and preventing mega-events by planning landscapes.
 - Planning recovering of landscapes and their ecosystem services after megafires.



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EULA-CHILE
Centro de Ciencias Ambientales

10 años
CEDEUS

cienciaAmbiental

Midiendo el paisaje y los servicios ecosistémicos asociados a su naturaleza

fdelabarrera@udec.cl

Workshop on Copernicus for Natural Capital and Ecosystems Services

City: Santiago

Date: November 27th, 2022