



WRI MÉXICO



INFORMING INVESTMENT & POLICY FOR URBAN GREEN-GRAY WATER SOLUTIONS

Washington D.C. December 2018



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¿HOW TO TRANSIT TOWARDS AN INTEGRATED POLICY?

URBAN DEVELOPMENT AND WATER

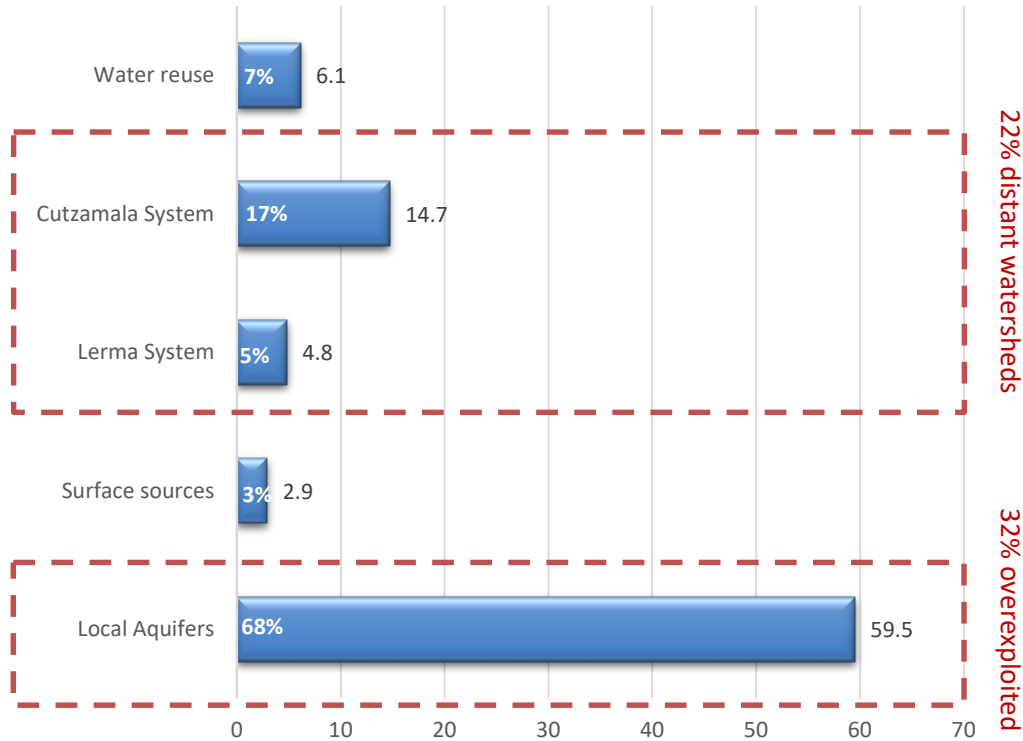
CONTEXT



- Mexico's Capital City.
- A thriving vibrant megacity, one of the largest contributors to our National GDP.
- Home to 8+ million inhabitants / within a 22+ million metropolitan area
- Extension of 1,485 millions of m²
- About 60% is urban area
- 33 millions m² including public areas *with or without green areas*

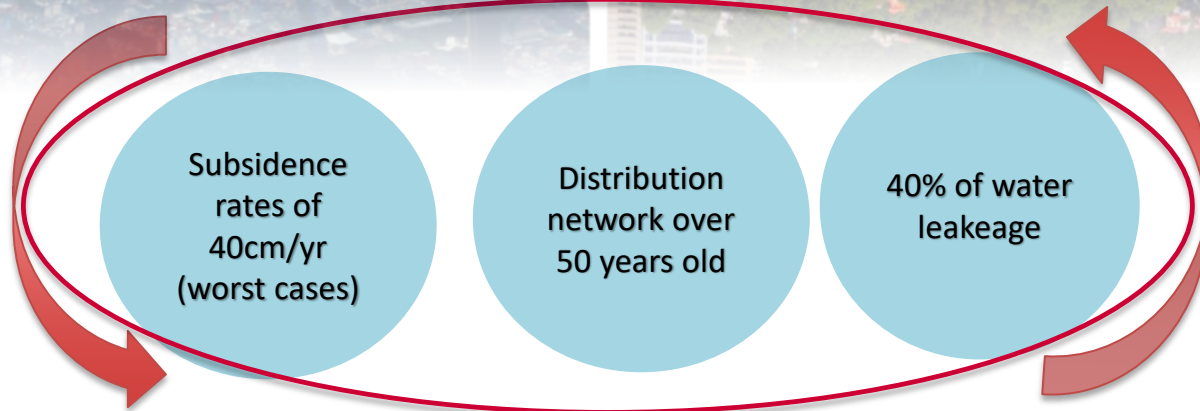
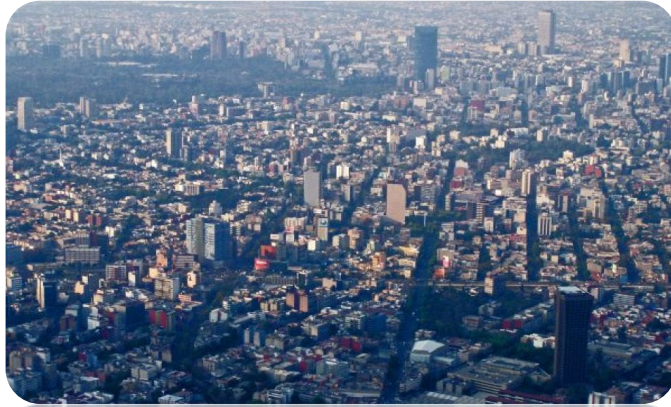
AND THE WATER?

Sources of supply



50-60% of the water that sustains Mexico city, comes from a non sustainable source, or one with high significant impacts.

WHAT ELSE GOES ON IN THIS BEAUTIFUL CITY...?



PARADOXICALLY...



21%
without
daily water
supply

Constant
water
floods

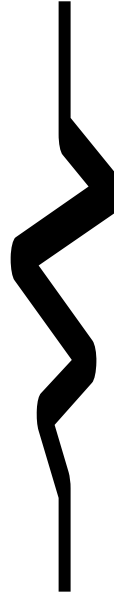




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WHY?

A LOT OF CHALLENGES, AND NOT MUCH COMMUNICATION...



WHAT DO WE ENVISION?



Mexico City : a water sensitive and water resilient city.

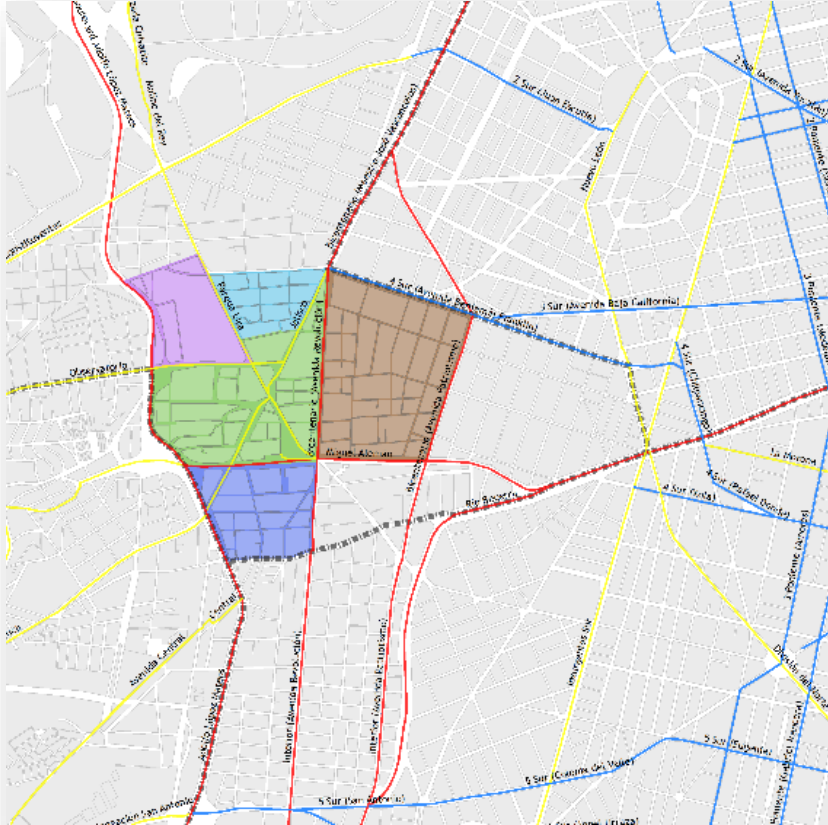


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TACUBAYA PILOT STUDY:

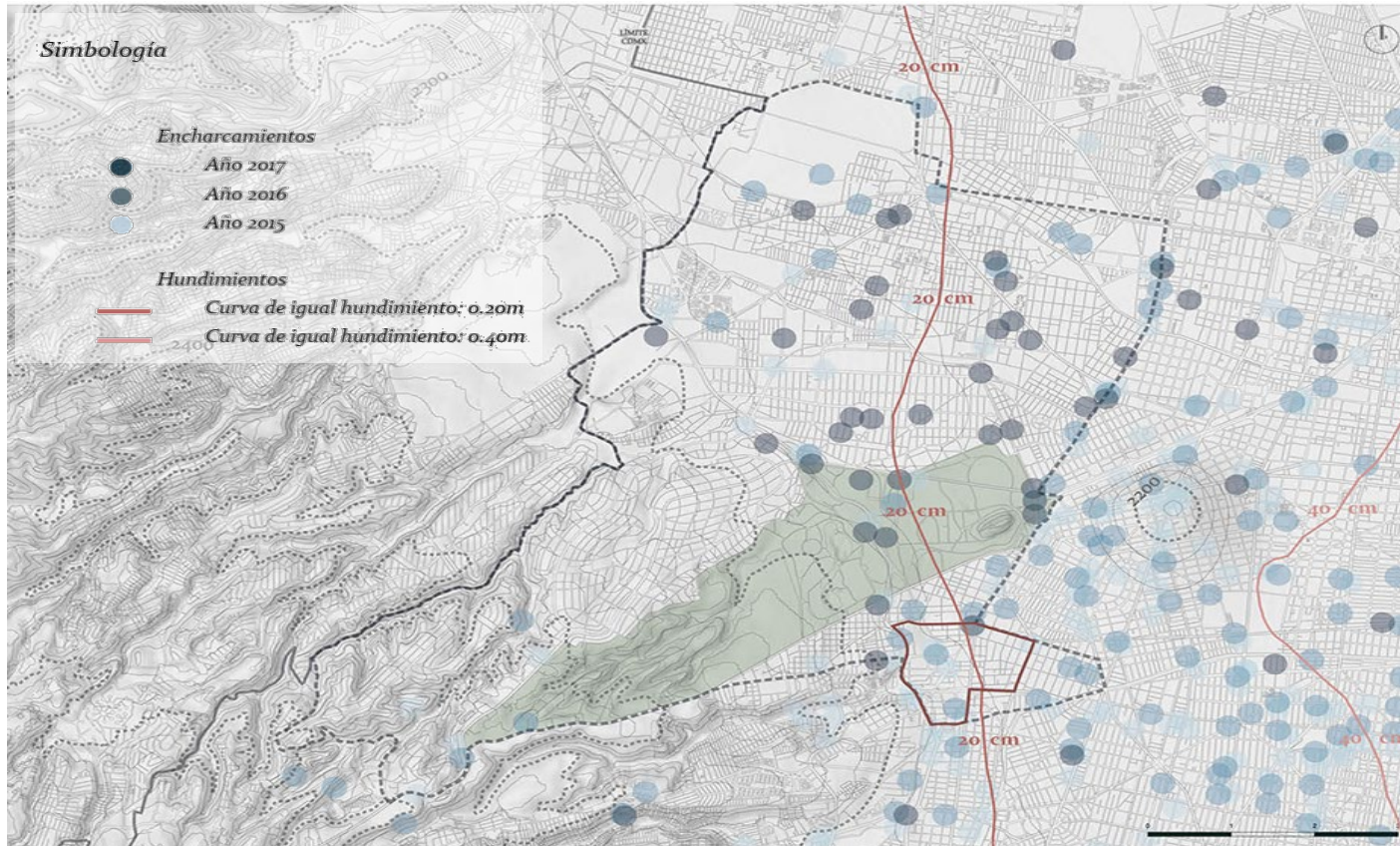
Urban Green-Gray water solutions to inform investment, policy and decision making

ABOUT TACUBAYA...



- 141 ha territory, right in the heart of Mexico City.
- Produces about 348k daily trips and attracts another 349k (heavily connected)
- Population approx 137/ha (19,000 inhabitants)
- Seriously underdeveloped

FLOODS (2015-2017)



Source: Sistema de agua y drenaje, plan hidrico delegacional, mapoteca SACMEX

GREEN SPACES AND TERRITORIAL GROWTH

Green spaces inventory

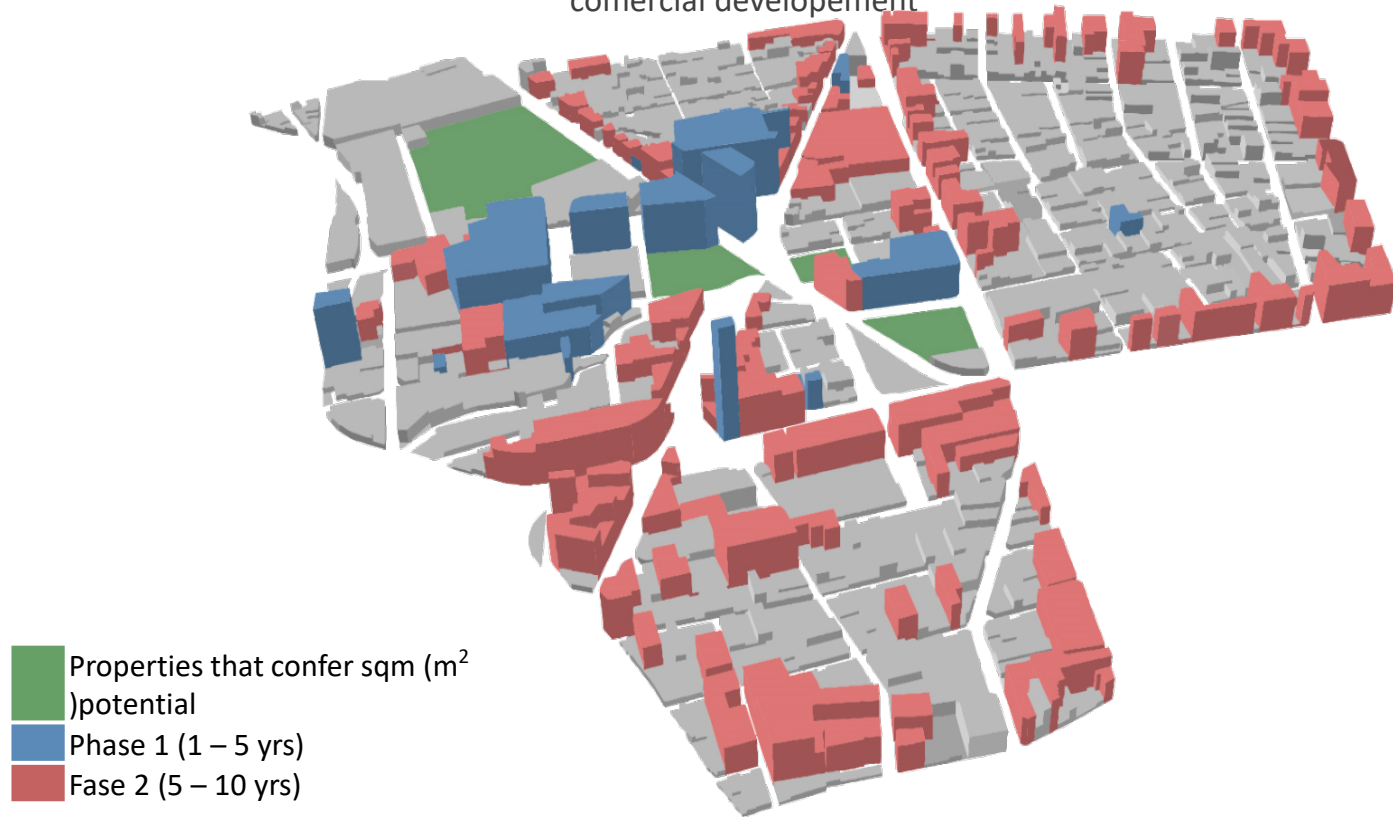


Growth – proxy for age



URBAN PERSPECTIVE...

1.9 million sqm (m²) of growth potential to be developed in the next 5 – 10 years | 9000 more dwellings + over 1 million sqm (m²) of comercial development





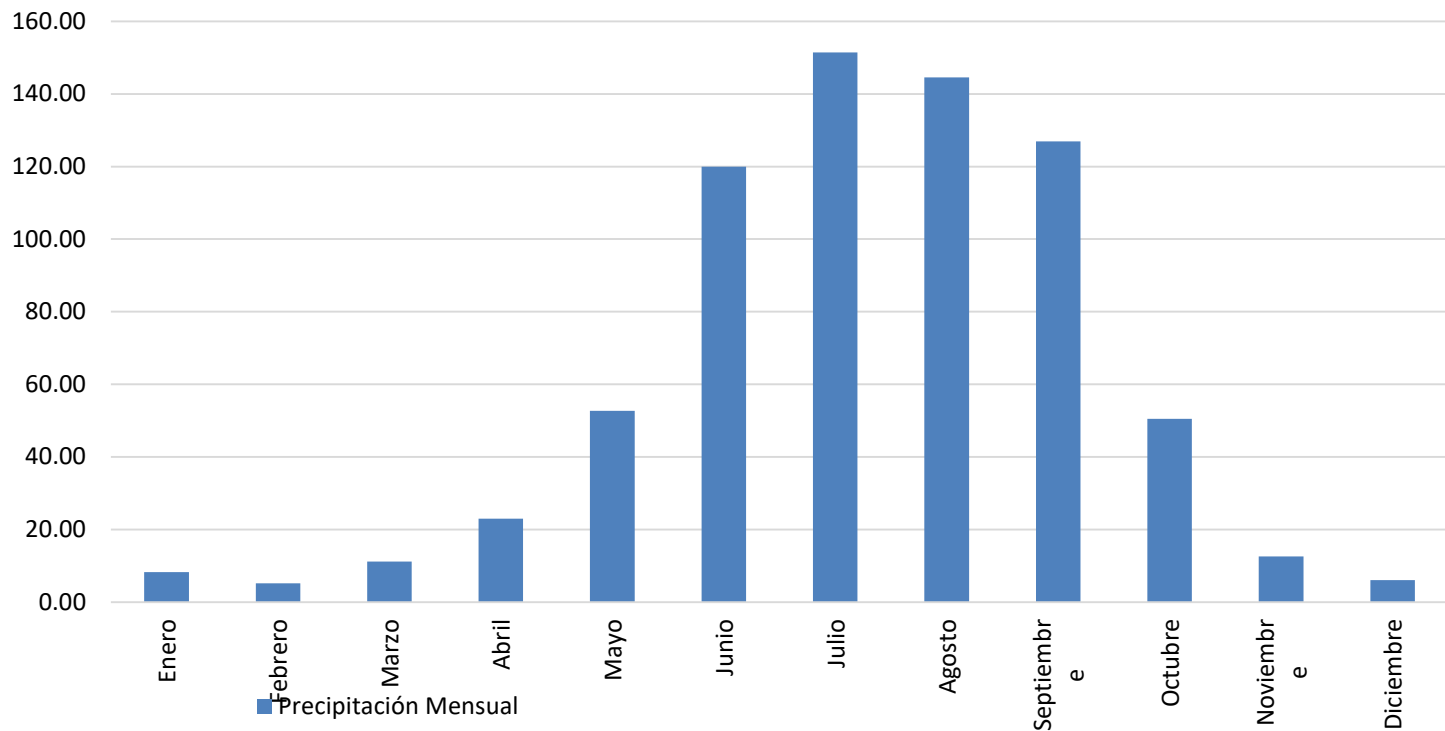
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WATER BALANCE

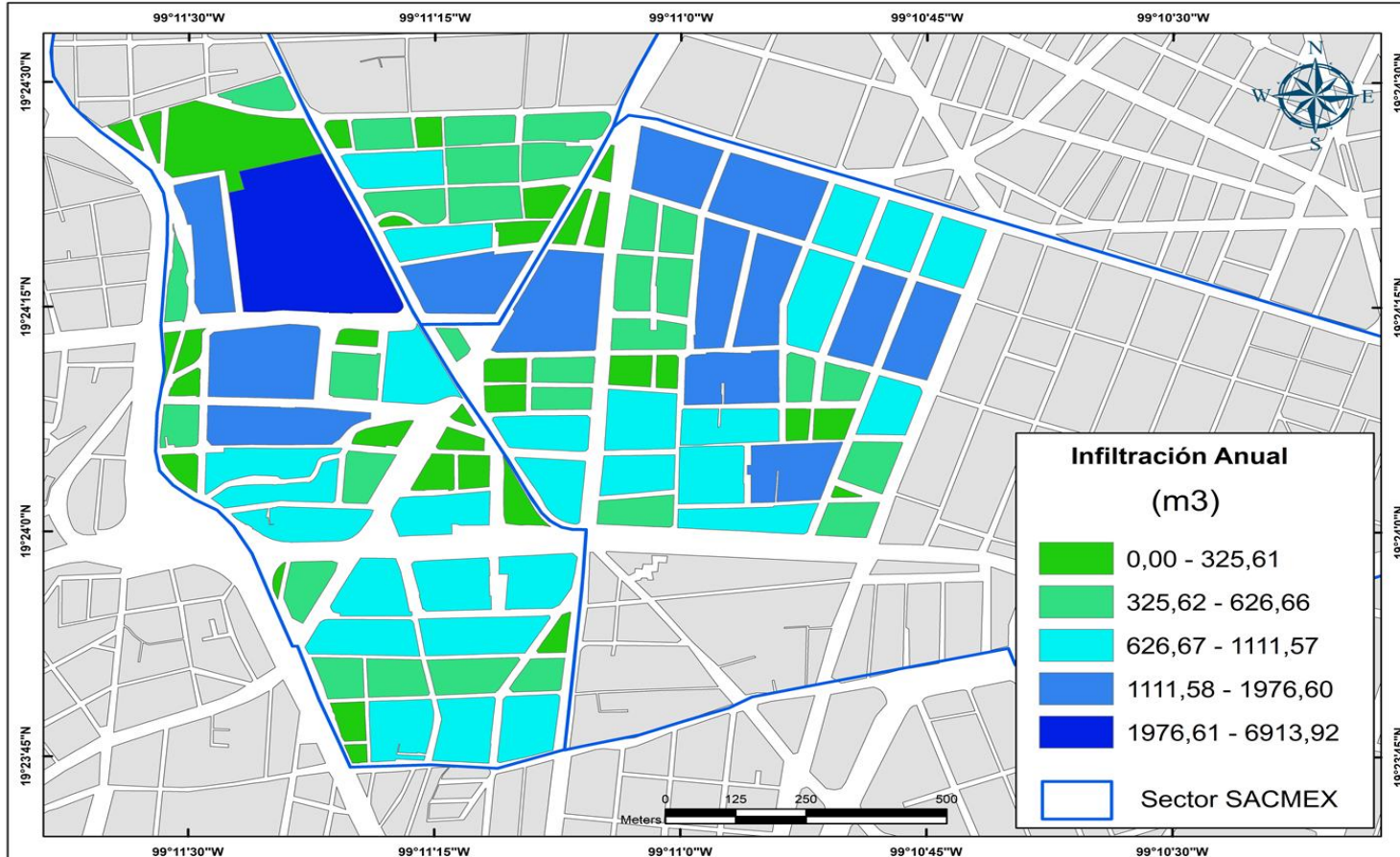
RESEARCH & ASSUMPTIONS

- Precipitation
- Total area per lots
- Potential infiltration per space
- Patterns of consumption

PRECIPITATION PATTERNS



PRECIPITATION & INFILTRATION POTENTIALS

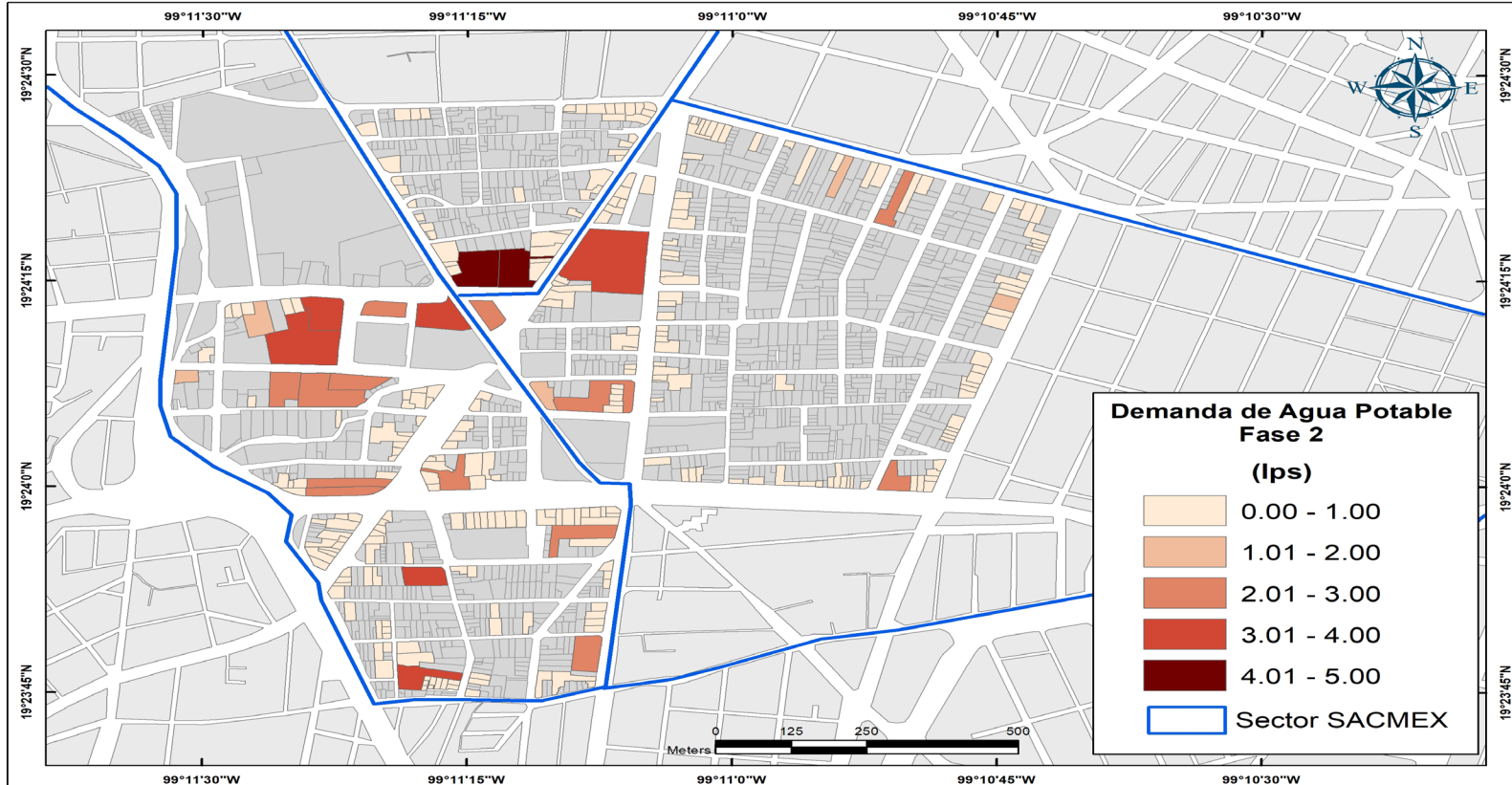


CONSUMPTION PATTERNS

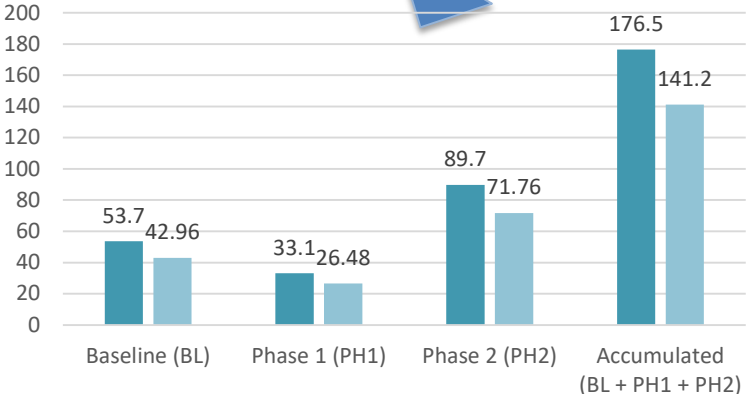
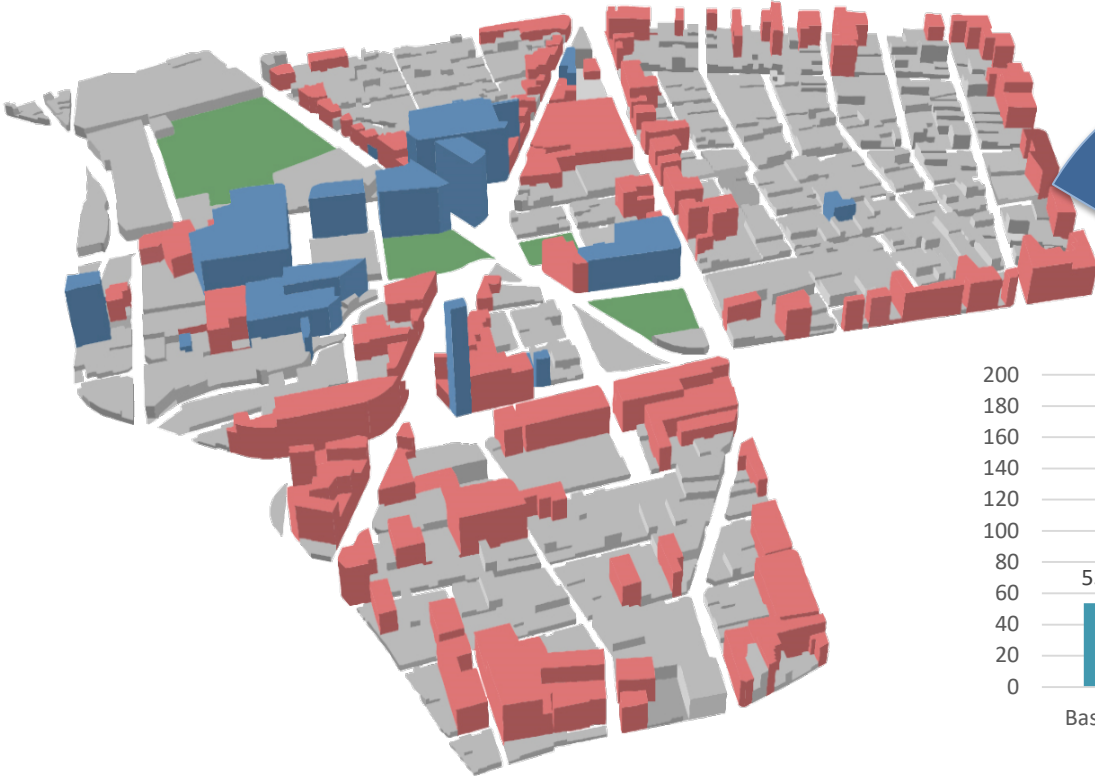
Assumptions and criterios to estimate water demand

Supuestos base		
Promedio de ocupantes por vivienda*	3	hab/vivienda
Pérdidas físicas***	40	%
% Drenaje***	80	%
Provisión mínima de agua potable		
Tipo de edificación	Dotación	Unidad
Comercio**	6	l/m ² /día
Comunicaciones**	2	l/m ² /día
Cultura **	5	l/m ² /día
Educación	25	l/m ² /día
Estacionamientos, patios y plazuelas**	1	l/m ² /día
Habitacional**	150	l/hab/día
Hotel ***	800	l/cuarto/día
Industria***	30	l/trab/día
Jardines**	5	l/m ² /día
Oficina***	20	l/m ² /día
Salud	800	l/trab/día

HYDROSANITARY PRESSURE MODELLING



A GLIMPSE INTO THE FUTURE...



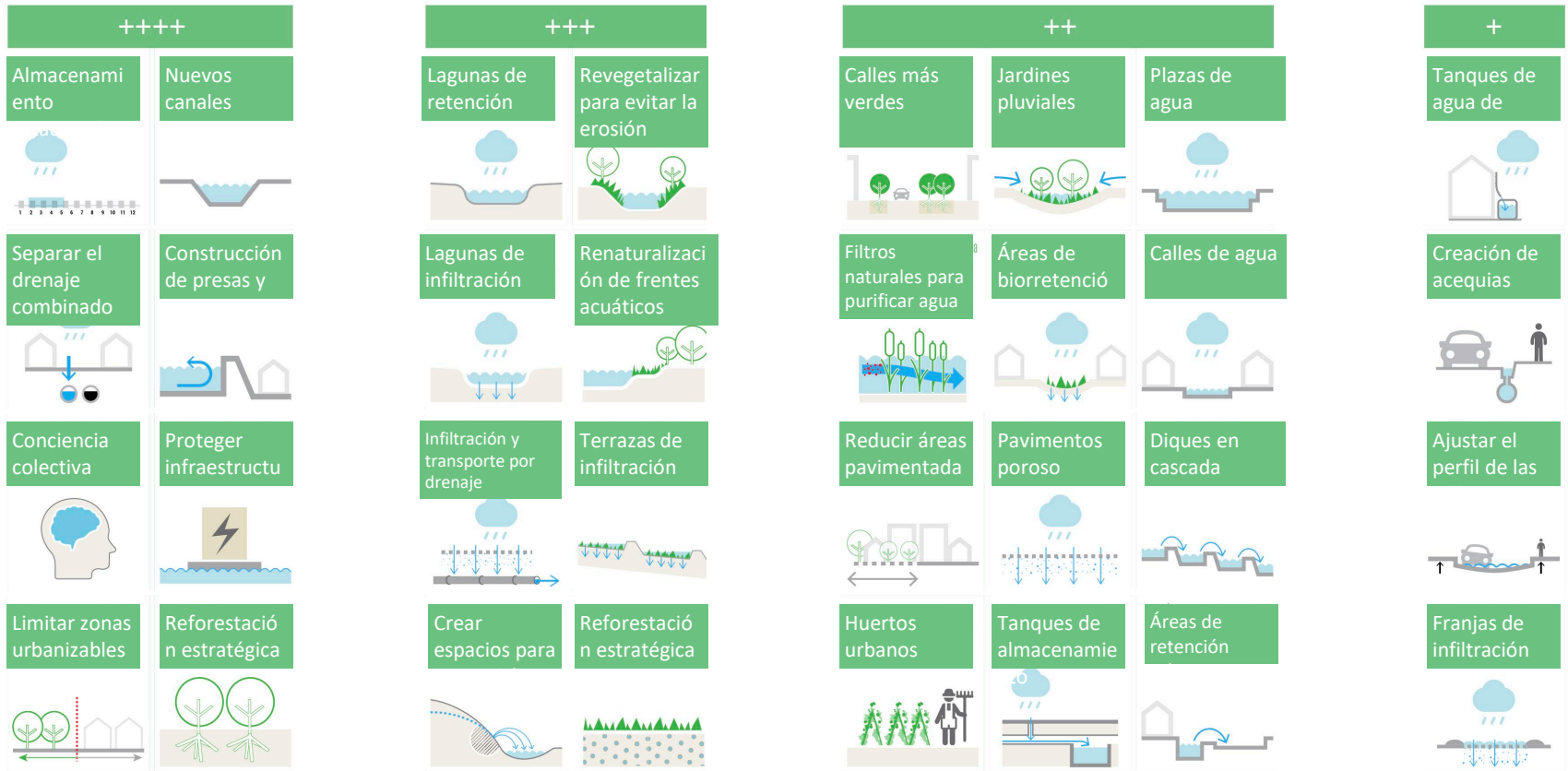
■ Potable water demand (l/s) ■ Sewer & drainage service demand (l/s)



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STRATEGY AND ACTIONS

TYPES GI OF SOLUTIONS AVAILABLE FOR CITIES



GREEN INFRASTRUCTURE & NATURE BASED SOLUTIONS



Retention lagoons

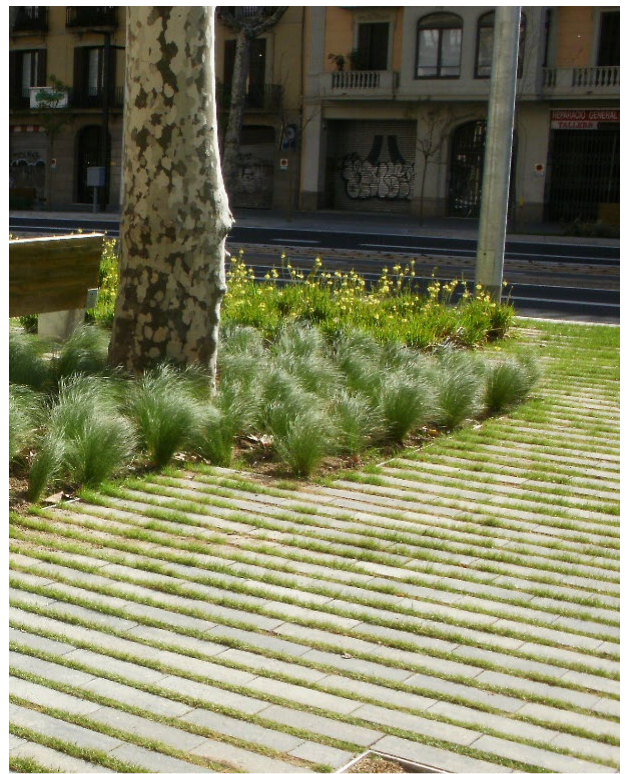


Water parks



Rain Gardens

GREEN INFRASTRUCTURE & NATURE BASED SOLUTIONS



Permeable pavement



Artificial wetlands



Infiltrating gardens

LINES OF ACTION



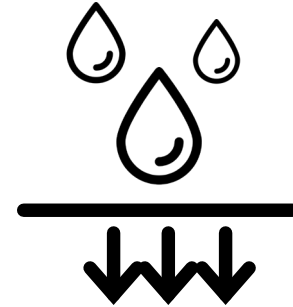
Water treatment

- Waste water treatment
- Gray Water Treatment
- Artificial wetlands



Water catchment and storage.

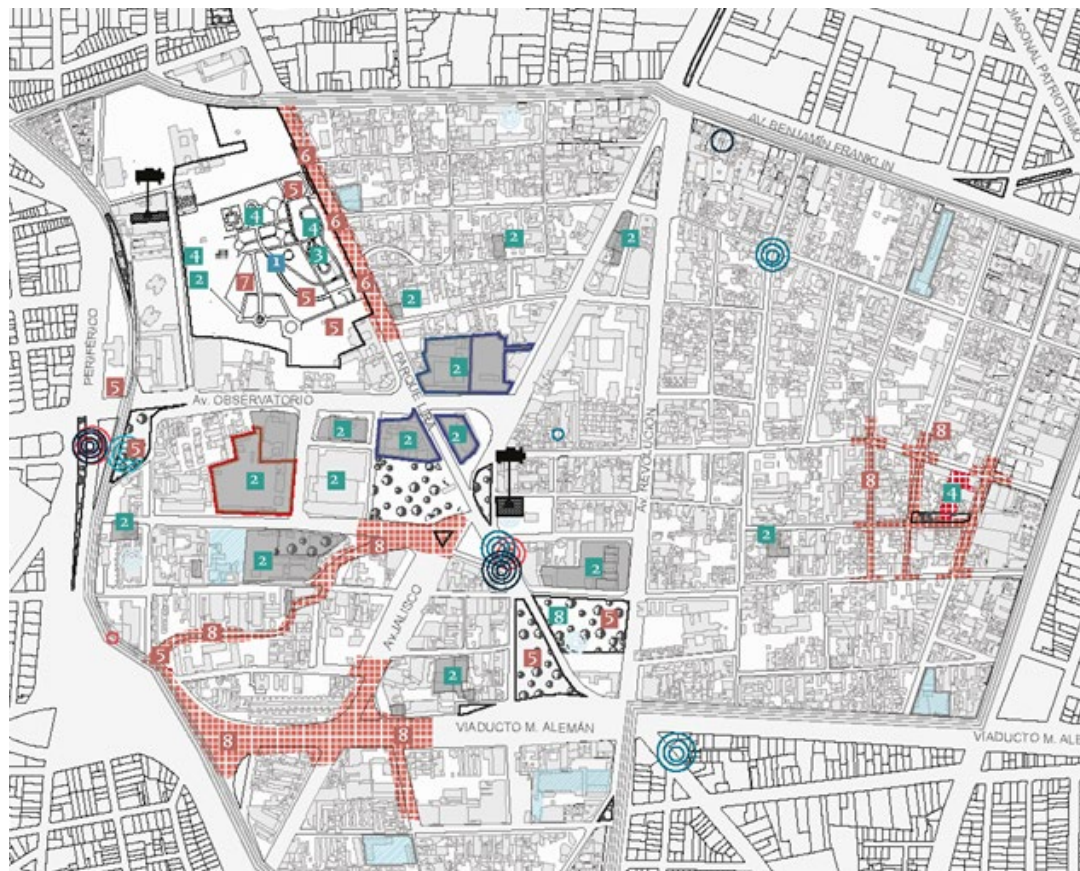
- Sports áreas infiltration tanks
- Roof catchment
- Catchment lagoons



Water infiltration and retention

- Infiltration and absorption wells
- Rain and infiltrating gardens
- Retention lagoons
- Permeable pavement
- Sponge soils

MAPPING THE SOLUTIONS



1 wetlands and bioswales

2 Rainwater roof catchment

3 Bioretention lagoons

4 rainwater catchment in public spaces

5 Rain-Gardens

6 Infiltration wells

7 Sponge soils

8 Permeable concrete



Graywater and wastewater treatment plants

Simbología

Líneas de acción

- Tratamiento de aguas
- Captación y almacenamiento de aguas pluviales
- Infiltración y retención de agua

Pavimentos infiltrables

■ Pavimentos infiltrables

Captación de agua en azoteas

■ Captación de agua en azoteas

Fase 1

■ Fase 1

Encharamientos

Year	0 - 20 m³	21 - 50 m³	51 - 200 m³	201 - 1000 m³	más de 1000 m³
2005	○	○	○	○	○
2006	●	●	●	●	●
2007	○	○	○	○	○
2008	○	○	○	○	○
2009	●	●	●	●	●

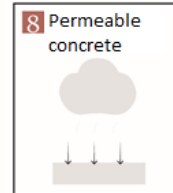
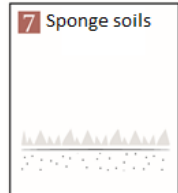
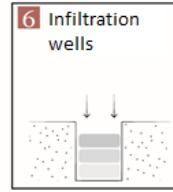
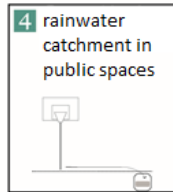
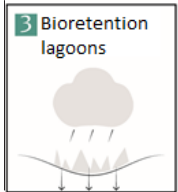
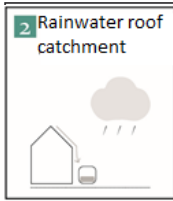
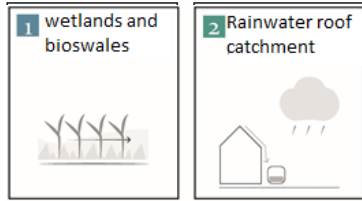
Agua jabonosa (Blue dashed line)

Agua residuales (Black dashed line)

Agua NOM Uso Comercial (Orange dashed line)

Agua NOM Uso Riego, fuentes, lagunas (Purple dashed line)

MAPPING THE SOLUTIONS



Simbología

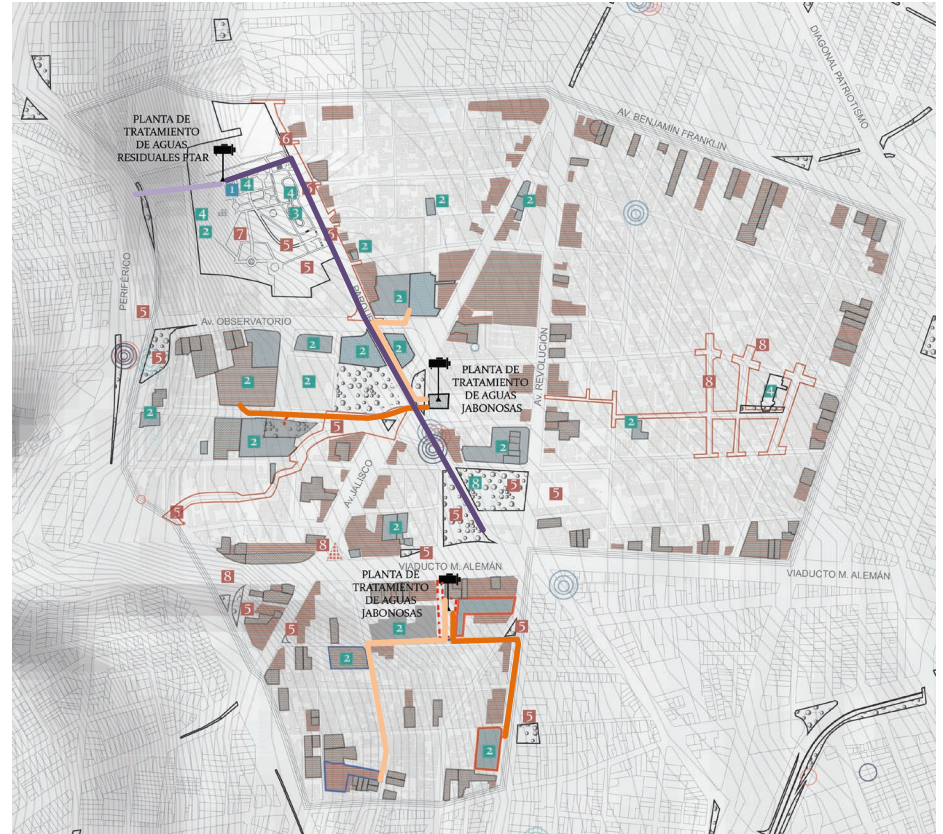
Líneas de acción

- Tratamiento de aguas
- Captación y almacenamiento de aguas pluviales
- Infiltración y retención de agua
- Pavimentos infiltrables
- Jardines pluviales
- Captación de agua en azoteas
- Fase 1
- Fase 2
- Oferta de aguas jabonosas
- Demanda de aguas jabonosas

Encharamientos

2005	2006	2007	2008	2009	
					0 - 20 m ³
					21 - 50 m ³
					51 - 200 m ³
					201 - 1000 m ³
					más de 1000 m ³

- Aguas jabonosas
- Aguas residuales
- Graywater and wastewater treatment plants



PLANTA DE TRATAMIENTO DE AGUAS RESIDUALES PTAR

AV. BENJAMÍN FRANKLIN

PERIFÉRICO

Av. OBSERVATORIO


PLANTA DE TRATAMIENTO DE AGUAS JABONOSAS

AV. REVOLUCIÓN


Av. JALISCO

VIADUCTO M. ALEMÁN


1 wetlands and bioswales




2 Rainwater roof catchment




3 Bioretention lagoons



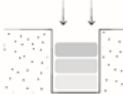
4 rainwater catchment in public spaces



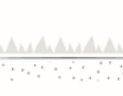
5 Rain-Gardens




6 Infiltration wells




7 Sponge soils

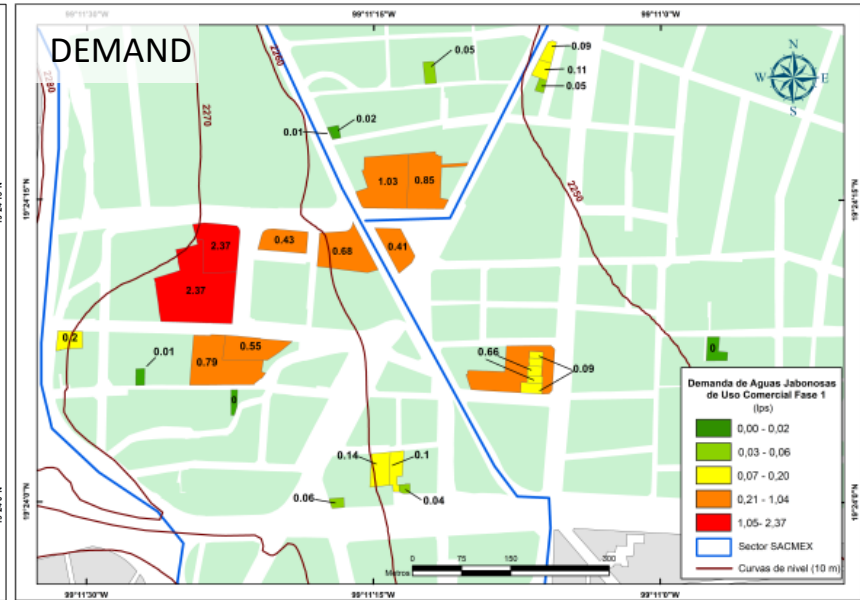
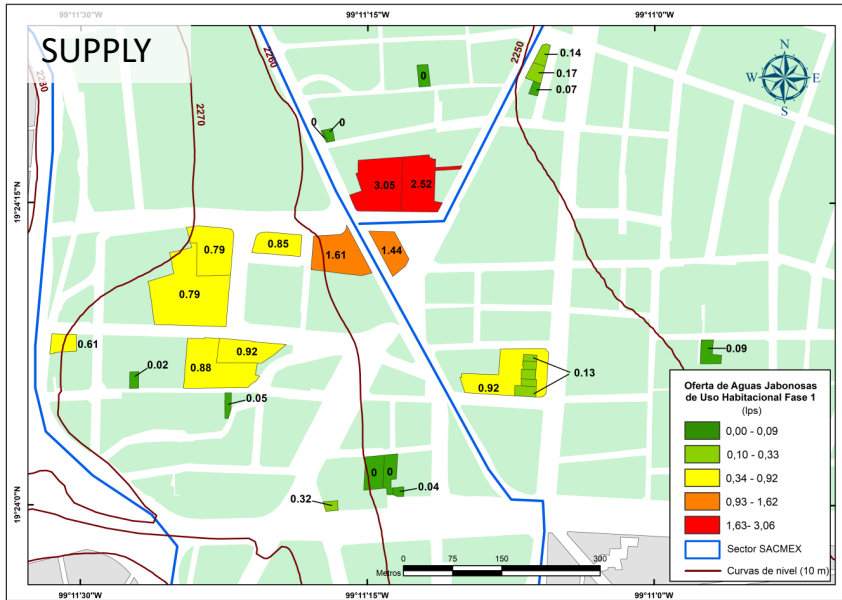


8 Permeable concrete



 Graywater and wastewater treatment plants

MAPPING GRAY WATER OPPORTUNITIES



FASE 1: Offer and Demand of Gray Water

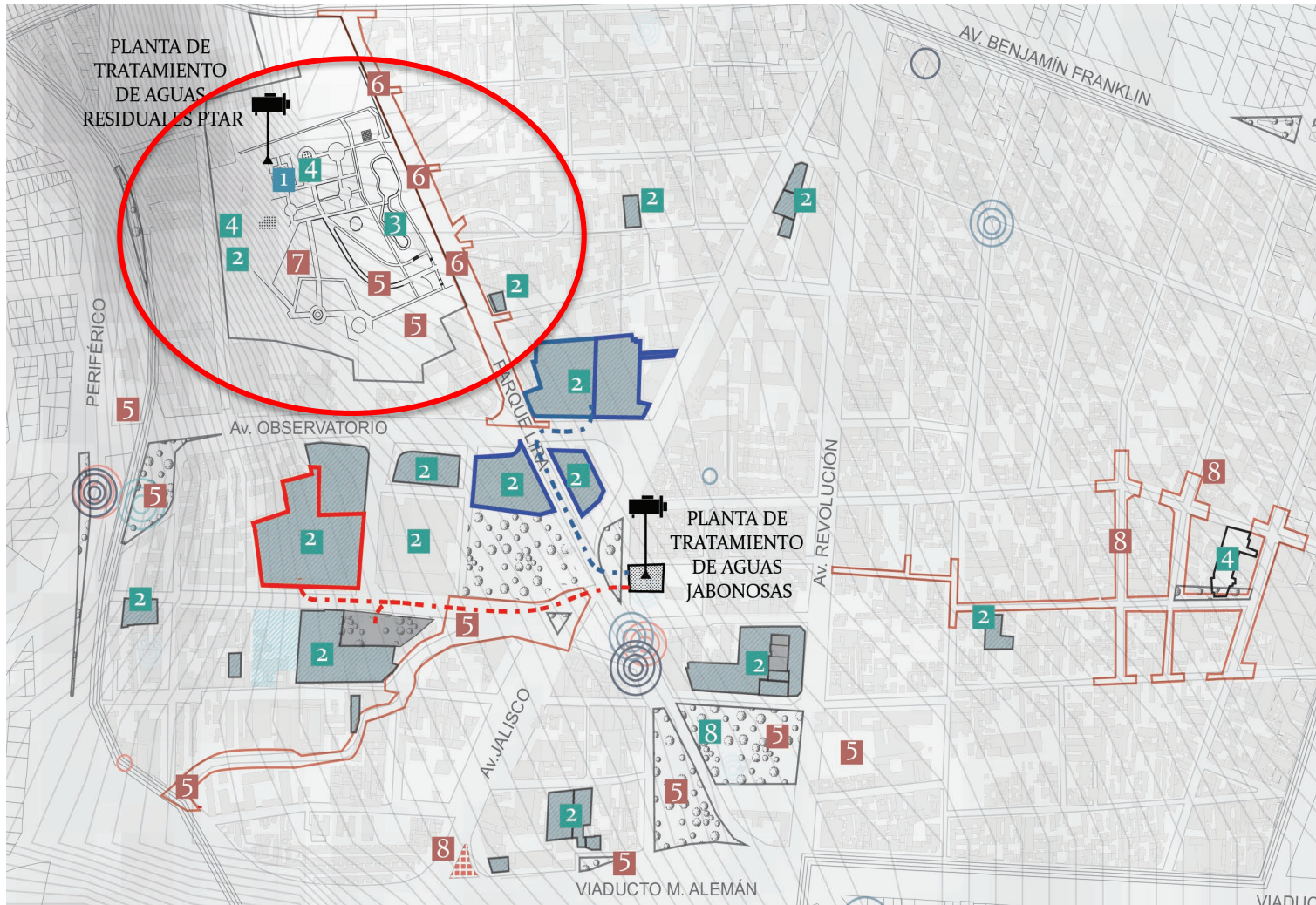
	HOUSEHOLD S	COMMERCIAL L	Households demand lps	Gray water supply (households) (76% of consumption) lps	COMMERCIAL L DEMAND lps	Gray water demand for comercial use (96% of consumption) lps
Stage 1	4,047	172,702	21.1	16.1	12.0	11.5



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PARQUE LIRA

A CLUSTER OF OPPORTUNITIES



PARQUE LIRA

No se perciben zonas inseguras en el parque, sino al rededor, en los cruces peatonales y a desnivel; principalmente desde el metro. Se observaron personas corriendo, paseando perros, jugando futbol rápido en la explanada junto a la pérgola, estudiantes haciendo tarea en las bancas, y haciendo uso del skatepark



La zona de la pérgola es utilizada como cancha para futbol por ser una zona plana y sin vegetación.

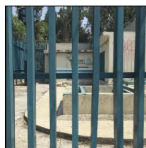


Espacio potencial para jardines de infiltración

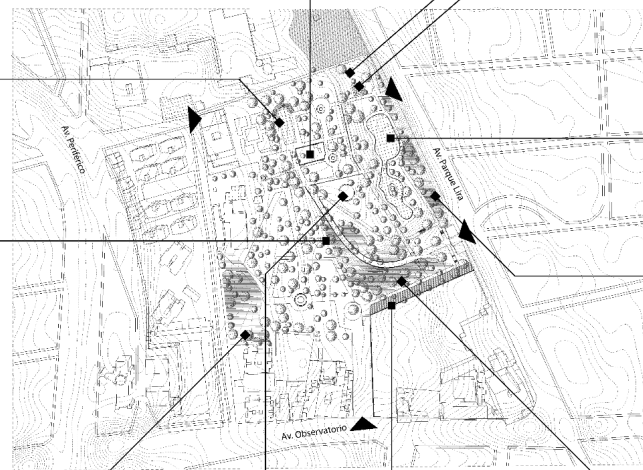


Los juegos infantiles están en una zona un poco aislada, con pendiente pronunciada.

Instalación cercada, es un pozo de agua potable en operación.



Pendiente poco pronunciada.



Explanada A: Pendiente poco pronunciada, tiene pocos árboles.



El skatepark se ve improvisado y en condiciones de deterioro, sin embargo es uno de los lugares que más atrae usuarios.



Colindancia calle: esta zona tiene poca pendiente y pocas copas de árboles.



La pendiente muy pronunciada, tiene un muro de contención de mampostería deteriorado en algunas zonas.

La Campana de la Paz es uno de los claros más amplios del parque, sin embargo está cercada por cuestiones de seguridad.



Junto a la colindancia: En esta zona la mayor parte de la vegetación son plantas bajas, es una zona inaccesible al visitante.

WATER SOLUTIONS POTENTIALS



PARQUE LIRA

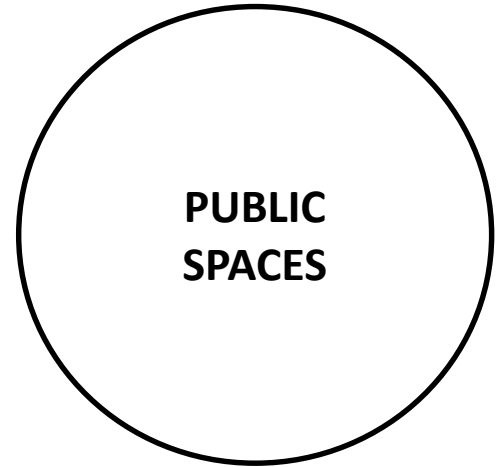
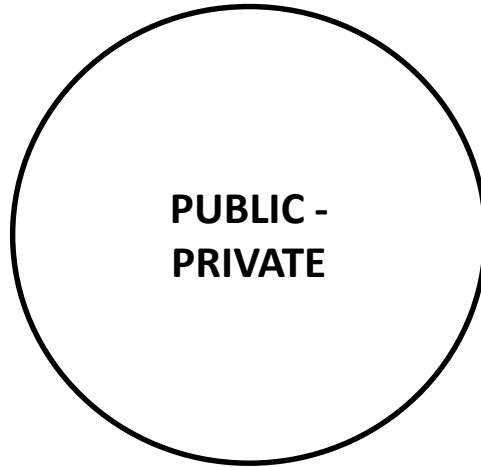
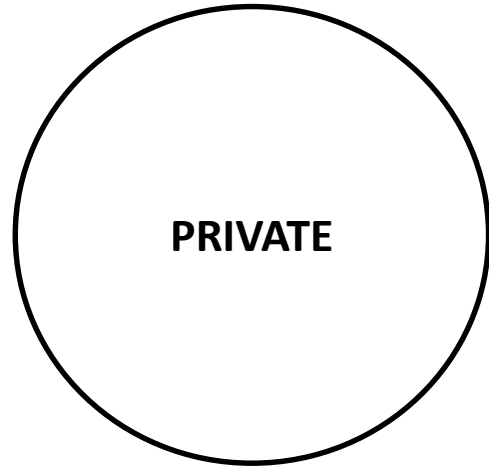




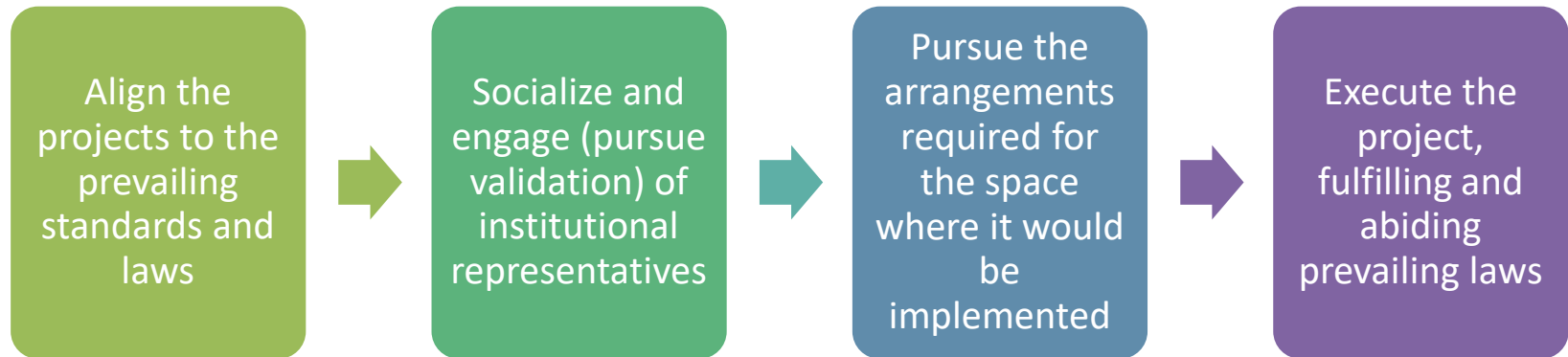
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LEGAL, INSTITUTIONAL AND FINANCIAL OPPORTUNITIES

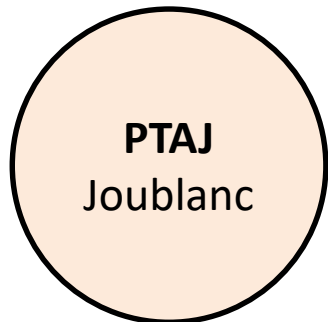
SCOPE OF ACTIONS



MAPPING THE INSTITUTIONAL PROCESS

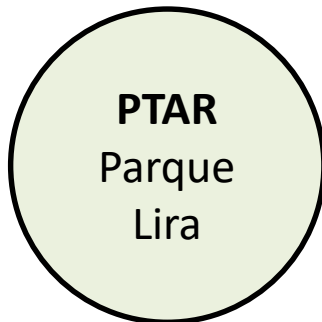


EVALUATE THE FINANCIAL OPPORTUNITIES



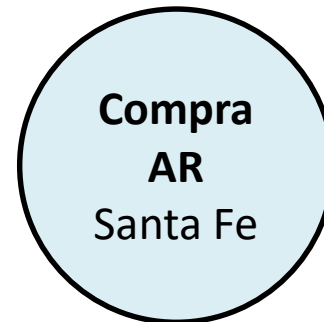
Capital investments \$15.8 MDP
 O&M fix/yr \$485K
 O&M variable \$14.70 /m3¹
 Yearly maintenance 5%+IVA over investment

VPN	\$ 8,115,595.49
ROI	4.11%
TIR	15%
PERIODO DE PAGO	6
B/C	\$ 1.41



Capital investments \$17.2 MDP
 O&M fix/yr \$485K
 O&M variable \$6.27 /m3²
 Yearly maintenance 5%+IVA sobre inversión

VPN	\$ 24,225,950.44
ROI	18.74%
TIR	25%
PERIODO DE PAGO	4
B/C	\$ 2.15



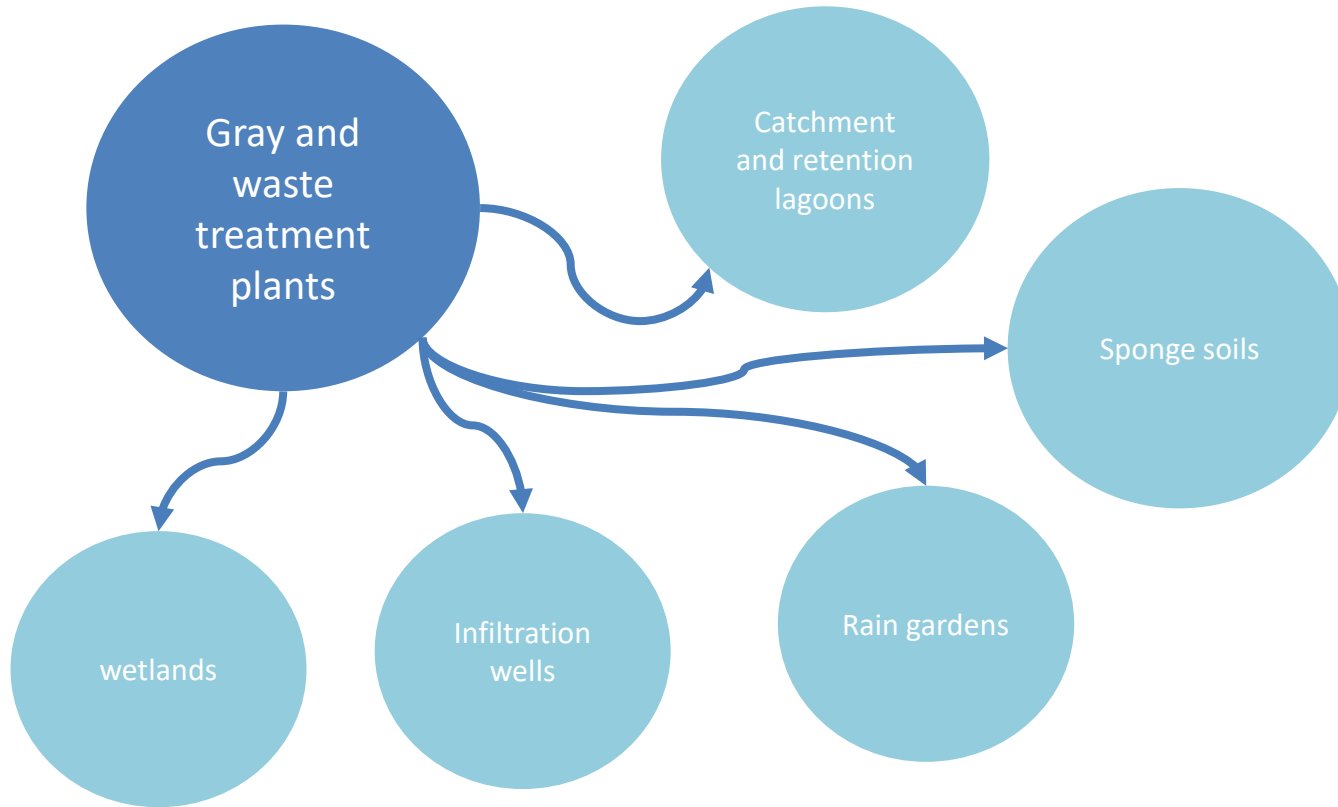
Yearly expenses
 - E1 \$7mdp at \$37.50 fix | 283.8 mdp a 40yrs
 - E2 \$var inflation 4% | 674.2 mdp a 40 años

No hay variables financieras
 No es Inversión

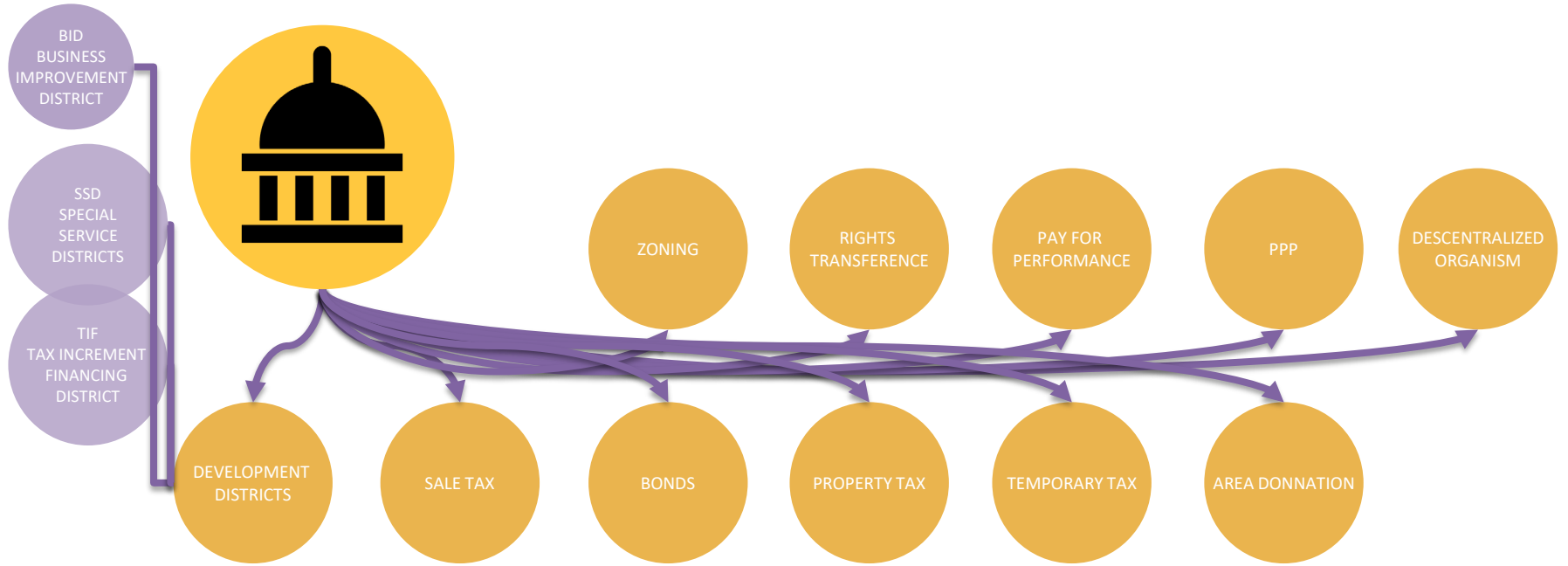
Nota: Estos resultados muestran casos hipotéticos con supuestos generales de mercado.

• ¹\$10.60 O&M + \$4.10 compra agua residual | ²\$2.17 O&M + \$4.10 compra agua residual

INVESTMENT CLUSTERS

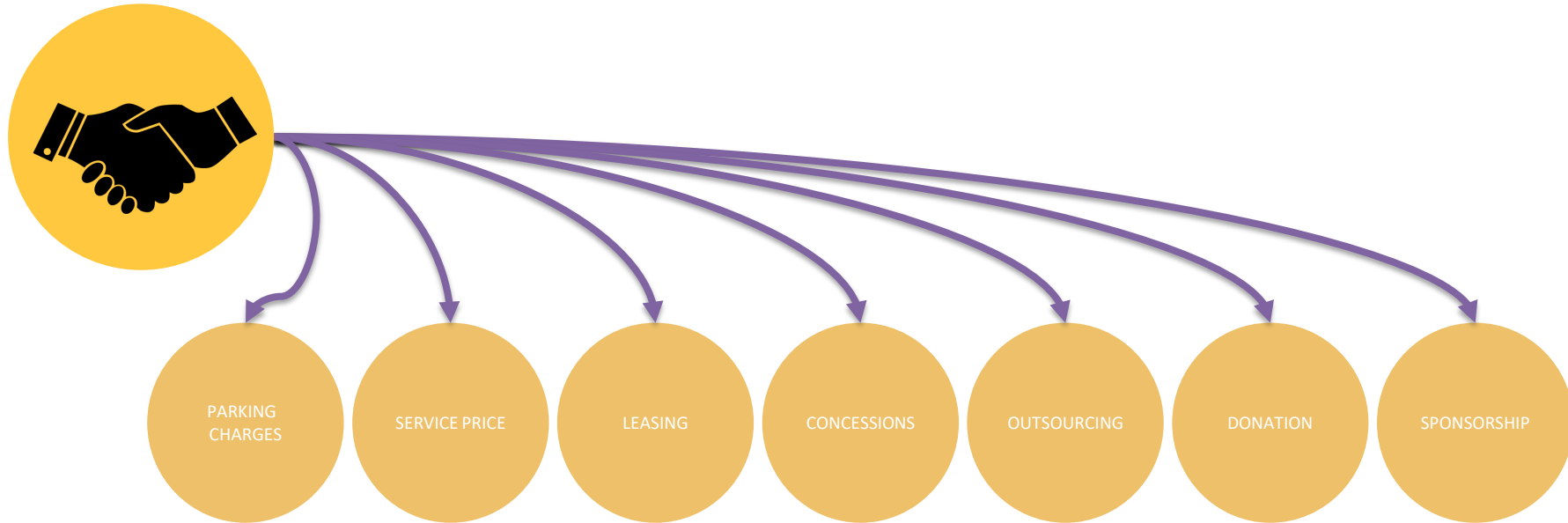


UNDERSTAND THE FINANCIAL IMPLICATIONS AND OPPORTUNITIES



Public Financial Mechanisms

UNDERSTAND THE FINANCIAL IMPLICATIONS AND OPPORTUNITIES



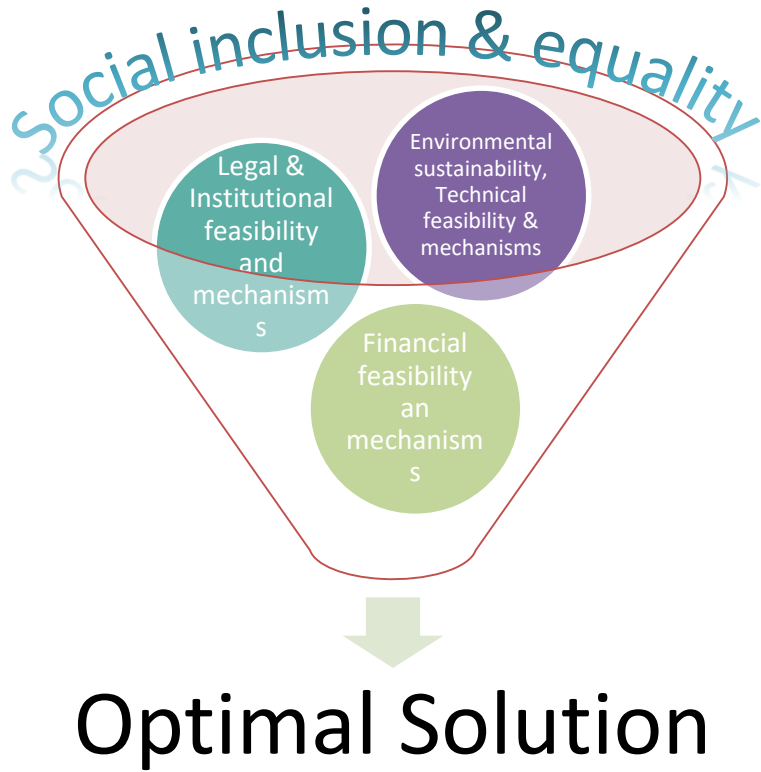
Private Financial Mechanisms



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CONCLUSIONS AND NEXT STEPS

THERE IS NO SILVER BULLET, BUT THERE ARE OPTIMAL SOLUTIONS





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