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정의롭고 풍요로운 광주

Case Study : Gwangju, Republic of Korea

Leading the Water Circulation Project

September 2020

광주광역시
GWANGJU CITY

1. Overview

Overview

- Project Name : Gwangju Leading the Water Circulation Project
- Duration : 2017. ~ 2021.(Now under development of working design)
- Background, Purpose

• Background : Increase in surface of water permeability in the city causing flood, depletion of underground water, dried stream, degradation of water quality and water ecology, etc.

• Purpose : Applying Low Impact Development(LID), to recover city's capacity to contain water and to respond against climate change and secure soundness of water circulation system

Project Outline

	Notes
Location (Venue)	**Chipyeong-dong, Seo-gu, Gwangju** (A=2.1km^2)
Contents	• Reduce surfaces of water permeability (91%→65%) • Key facilities applied LID - Public facilities : police office, elementary school, convention center, broadcasting system, community service center - parks - parts of main avenue, etc.
Expenses	29.5 bil. KRW (appr. 24.8 mil. US$) - 70% from national govt., 30% from local govt.

Timeline

- 2016.05. Gwangju selected as a leading city of water circulation (5 cities in the nation)
- 2017.07.~2018.12. Gwangju made water circulation plan
- 2018.08.~2020.09. Now developing working design
- 2019.01.~2019.08. Visit best practice site, public hearing
- 2019.12.~2020.01. Technical review, expert advice
- 2020.10.~2021.12. Construction

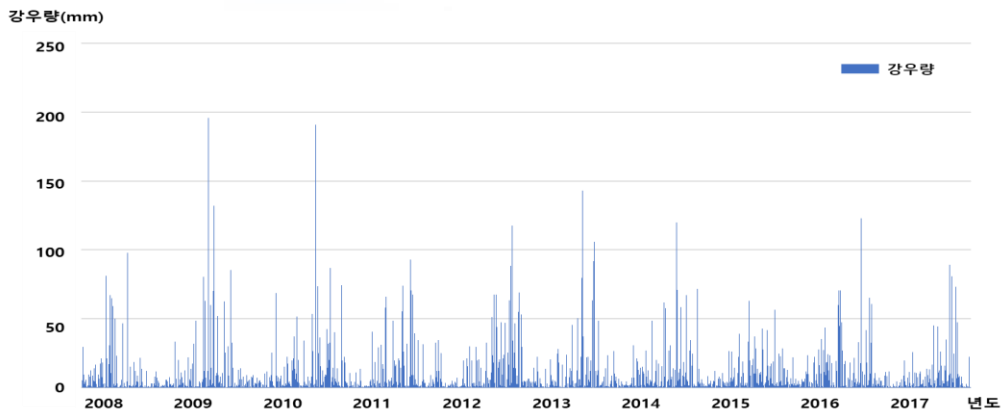
2. Baseline Data Research

Calculation of water circulation target

1 Review on reduction target of rainfall

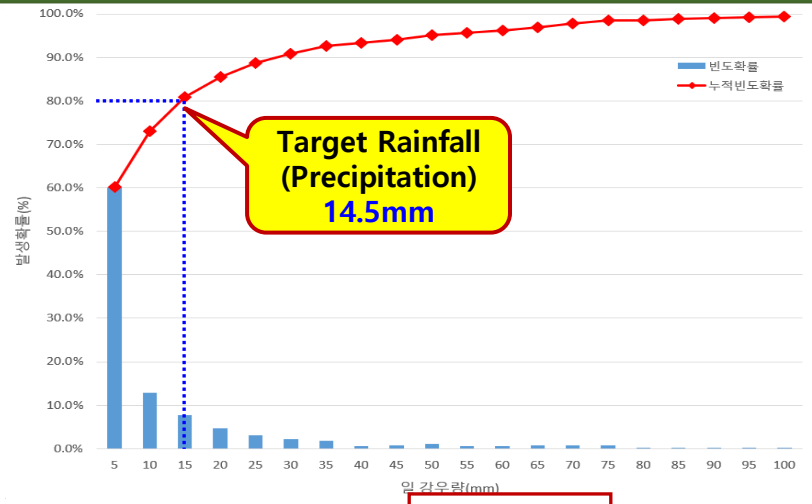
- Use management technologies of rainfall events (percentile rank)
- Analyze rainfall events using 10-year data since 2017

Analysis of rainfall events



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avr.
Rainfall/Yr (mm)	1,007.2	1,488.2	1,573.1	1,300.3	1,626.8	1,246.4	1,288.8	1,100.1	1,482.3	936.5	1,305.0
Avr. Rainfall per event (mm)	8.8	11.2	11.1	10.7	12.4	11.0	10.3	9.2	11.8	8.3	10.5
Events/Yr	115	133	142	122	131	113	125	120	126	113	124

Analysis of rainfall events by target percentage



Cumulative Incidence Frequency	75%	80%	85%
Daily Rainfall (㎜)	11.5	14.5	19.5

Target water circulation in the area is 14.5mm,
80% of cumulative incidence frequency per year.

2. Baseline Data Research

2 Target setting of water circulation

- 91%(1,857,869㎡) of target area is impervious (water impermeable)
- Set target per zone

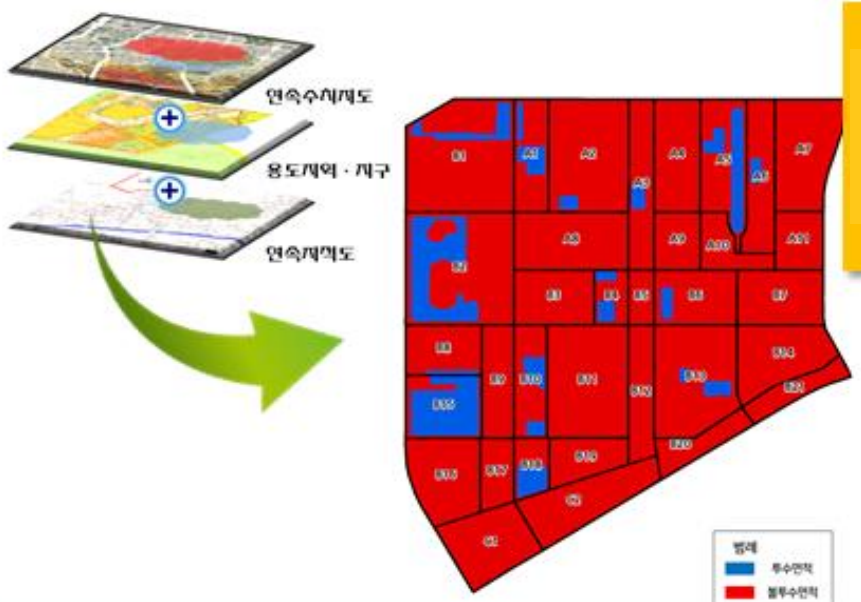
※ Zone A, B, C were categorized by water outlet

Impervious areas

Entire area 2,065,562㎡

Impervious area 1,857,869㎡

Impermeability 90.6%



Applying target rainfall 14.5mm

Set target amount

Impervious area x target rainfall = target amount

Target (Zone A) 9,046.9㎥

Target (Zone B) 15,890.4㎥

Target (Zone C) 2,001.7㎥

Total Amount 26,939.1㎥

3. Working Design

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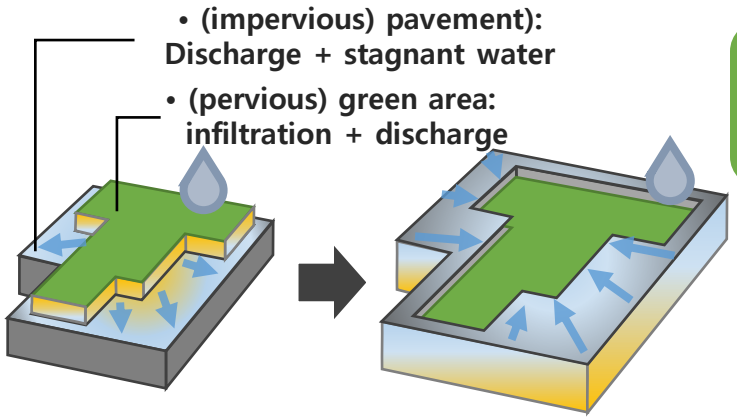
How to apply LID(Low Impact Development) Facilities

1 Arrangement in the target area

Gray Infrastructure → Green Infrastructure	Maximize LID	Inflow of rainfall into LID green space	Water circulation with multi-layered green space	Green & Blue Network System
- Single purpose → Multiple purpose - Urban infra. + green area + water circulation + ecology + landscape + leisure	- Various vegetation spaces : less impervious, more green - Expansion of ecosystem service	- Loss of rainwater and soil : clogged manholes/trenches - Block-type green space → concave-type space	- High underground water level → evapotranspiration by vegetation is required	- Connection of all green spaces - Connection LID facilities and waterways - Connect street trees with vegetation

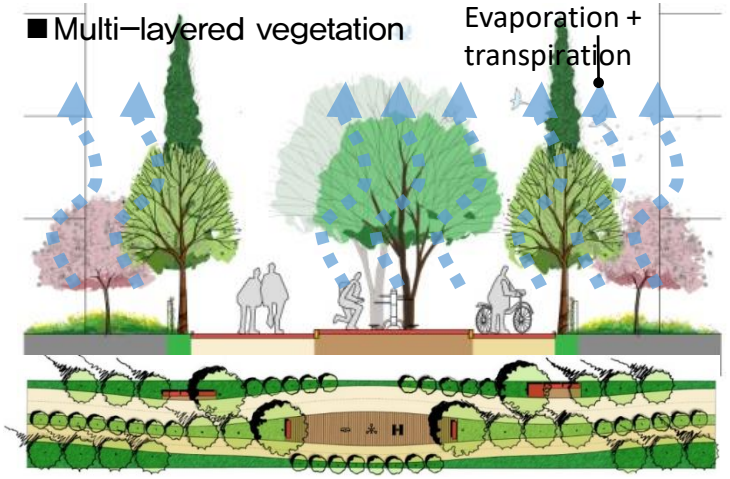
■ Inflow of rainwater to LID green space



Structural change of Water Mgt. into green areas

water inflow (infiltration, filtration in a timely manner)

■ Multi-layered vegetation



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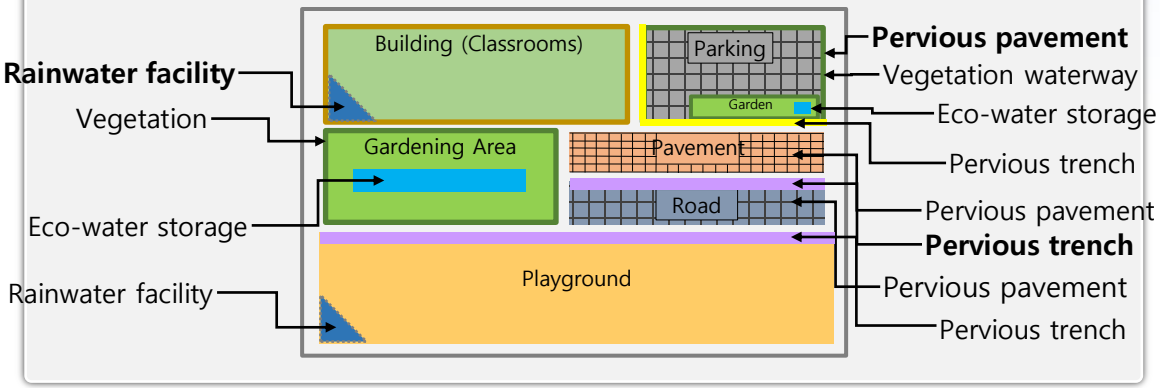
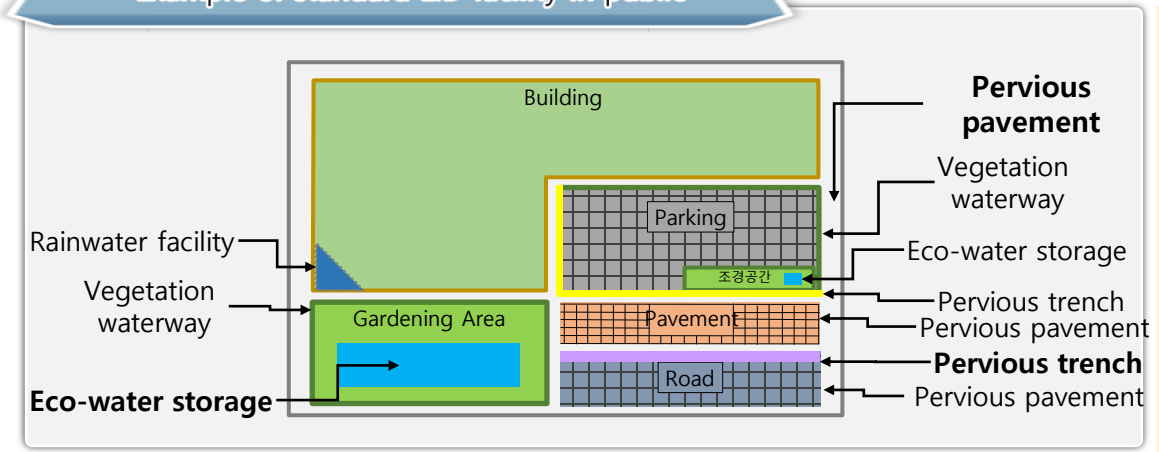
2 Application of LID to public facilities

- **Applied LID techniques to available areas considering feedback from stakeholders (education, public, etc.)**

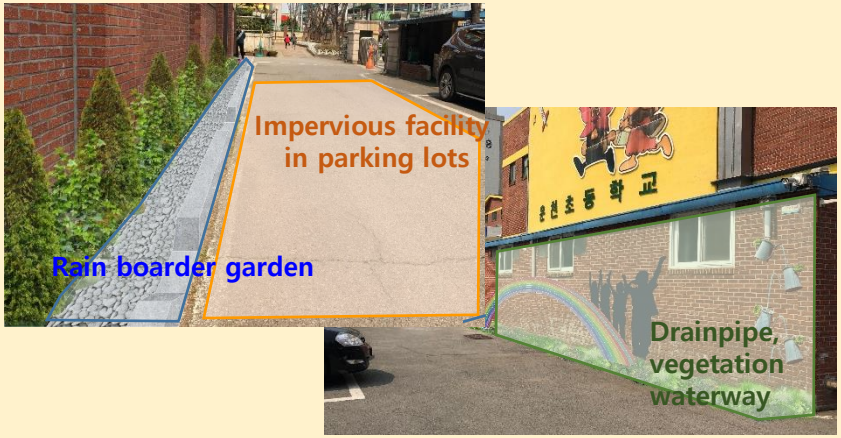
Example of standard LID facility in education



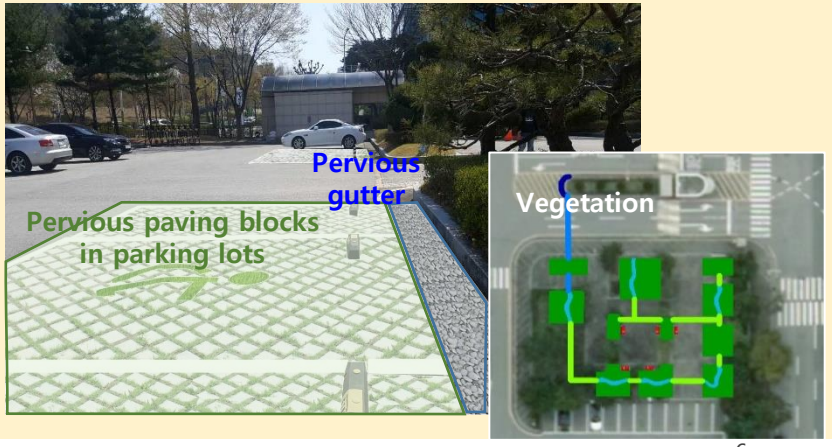
Example of standard LID facility in public



Elementary School



Police Station



3. Working Design

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3 Application of LID on road

- Applied LID techniques considering land use, etc. of the target area
- Road-focused design(street, pedestrian road), width of roads are considered to made a design plan

Street(for vehicles)

- Vegetation Facility – outstanding nonpoint pollutants reduction, average runoff reduction
- Pervious facility : outstanding runoff reduction, less nonpoint pollutant reduction
- Vegetation facility is recommended for roads with heavy traffic and/or many lanes

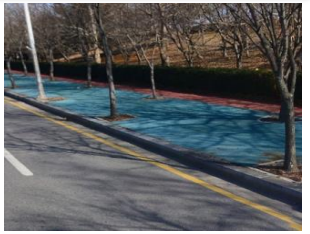
Low — Nonpoint Source Polllution — High

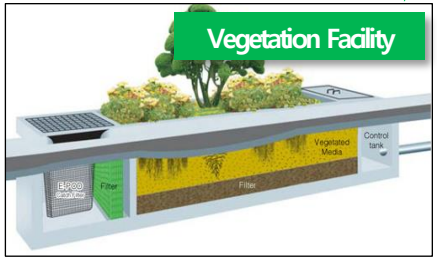
✓ More lanes → more traffic
→ higher nonpoint pollutant concentration

Pedestrian road

- Vegetation Facility – for enough spaces on pavement
- Pervious Facility – for narrow spaces on pavement or not enough space for vegetation facility

✓ Pedestrian road with 5 meters width or more : vegetation recommended
✓ Road for less than 5 meters width : pervious facility recommended



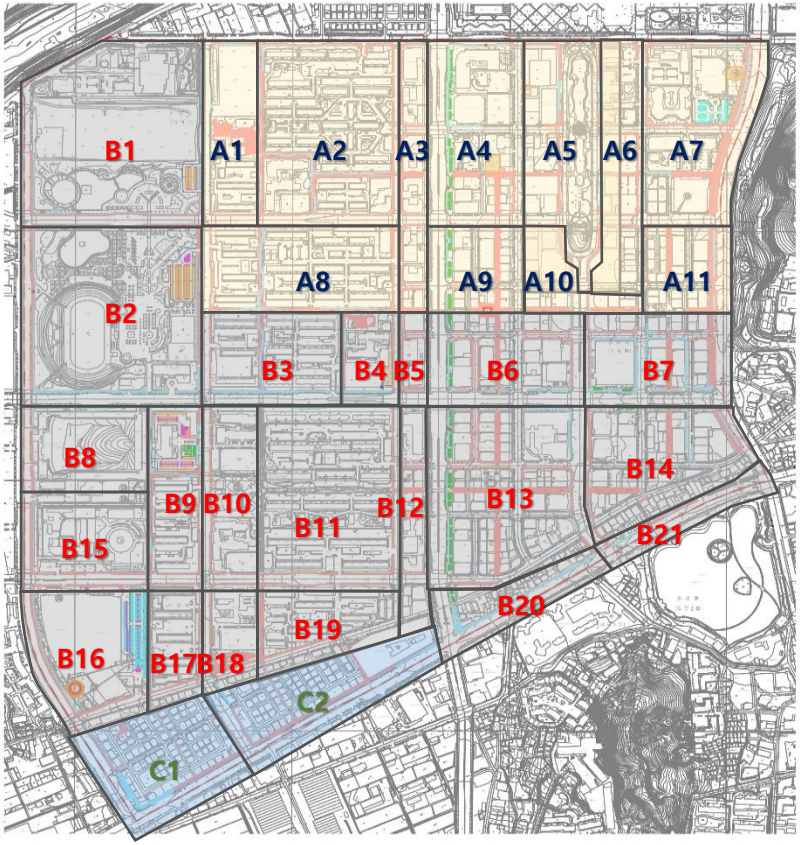


3. Working Design

Plan to arrange LID (Draft)

1 General plan : on target area (draft)

- Applied LID techniques considering rain spill, land use, etc. of the target area
- Achieve the target amount by vegetation (22.3%) and pervious facilities(77.7%)



	LID Techniques		Amount(㎥)	Rate(%)
VEGE-TA-TION	Tree Pit		13.5	0.0
	Bioswale		1,292.1	4.1
	Rain Garden/Bio Retention		5,371.3	17.0
	vegetation waterway		356.4	1.1
	Net Sum		**7,033.3**	**22.3**
PER-VIOUS FACI-LITIES	pervious gutter flow	U4	1,777.8	5.6
	pervious trench	DA	105.7	0.3
	grass-covered pavement		2,327.3	7.4
	pervious blocks (collect & save water)		6,805.4	31.1
	pervious blocks		4,515.4	14.3
	pervious blocks(parking lots)		424.6	1.3
	bike lane (pervious paving blocks)		2,318.0	7.3
	bike lane (pervious asphalt concrete)		3,257.1	10.3
	pergola		0.0	0.0
	Net Sum		**24,531.3**	**77.7**
	Total		**31,564.6**	**100.0**

3. Working Design

2 Example of LID : pavement (pedestrian road)

3. Working Design

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3. Working Design

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2 Example of LID : pavement (pedestrian road)

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2 Example of LID : pavement (pedestrian road)


Before LID : pathway


After LID : linear green space


Before LID : impervious pathway


After LID : vegetation + pervious pavement

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2 Example of LID : commercial district

Before LID : impervious pathway

After LID :
grass-block pavers + vegetation

Before LID : impervious pathway

After LID :
Grass block pavers + pervious pavement

3. Working Design

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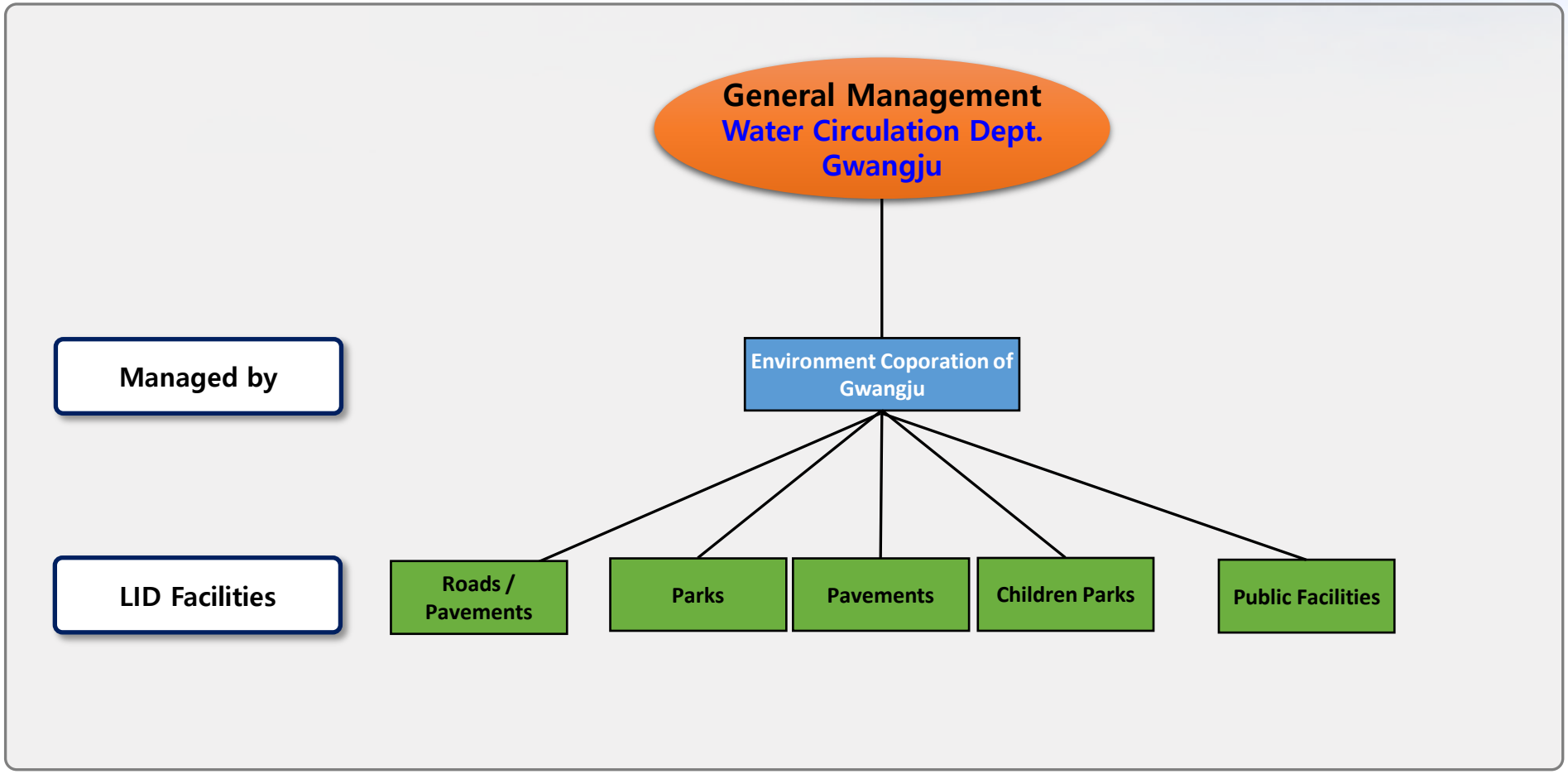
2 Example of LID : commercial district

3. Working Design

Maintenance Plan

1 Stakeholders for maintenance (Draft)



Thank You

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