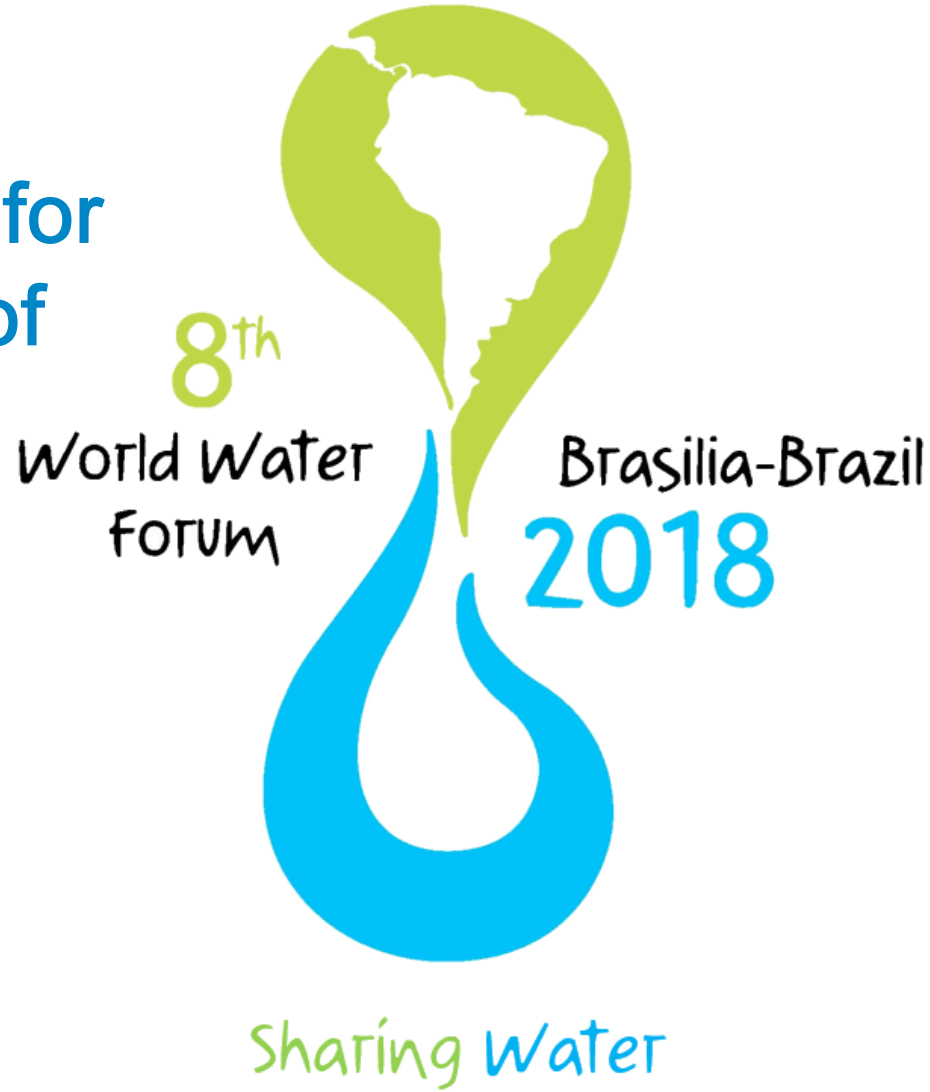

8th
World Water
Forum
Brasília-Brazil
2018

Effective and Sustainable Design for Water-Wise Cities: Case studies of Korea



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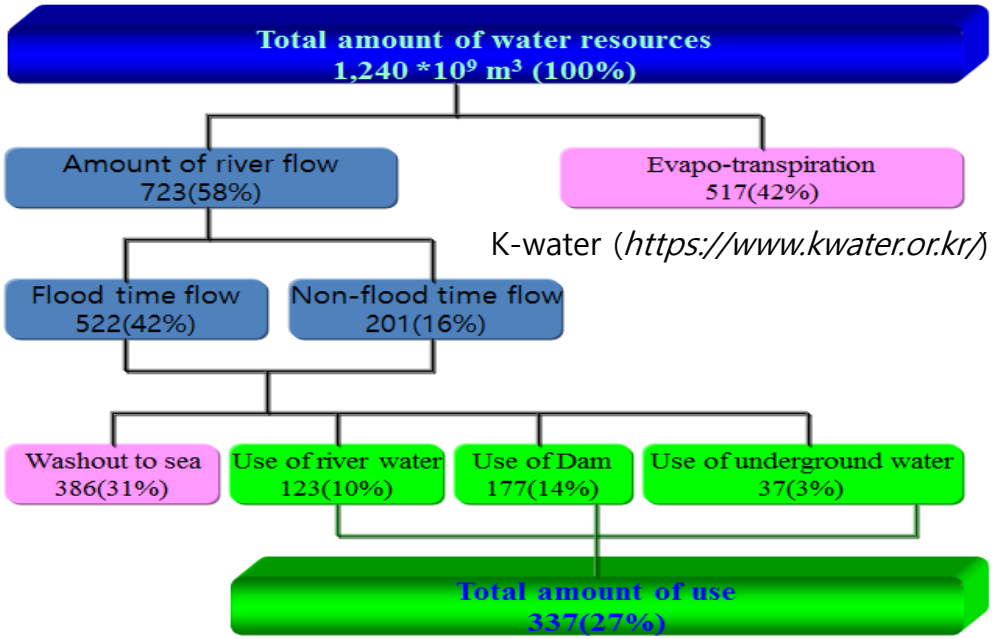
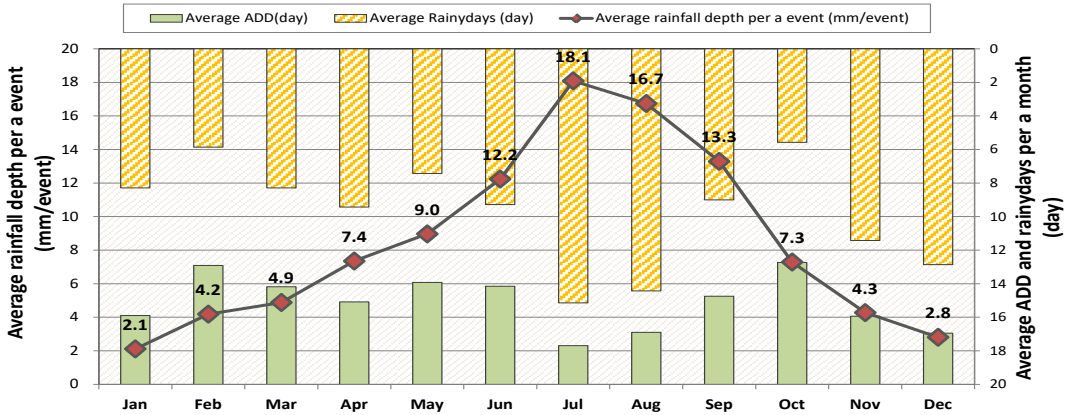
Board member, IWA Diffuse Pollution Specialist Group
Vice president of Korean Society on Water Environment(KSWE)

Water resources in Korea

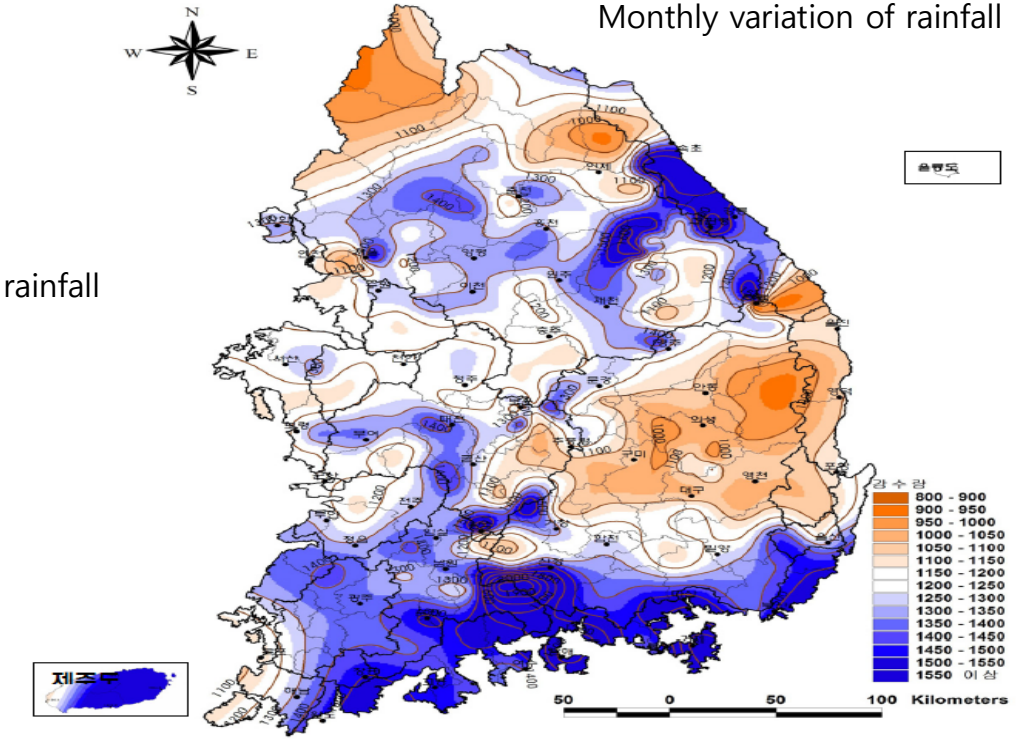


K-water (*https://www.kwater.or.kr/*)

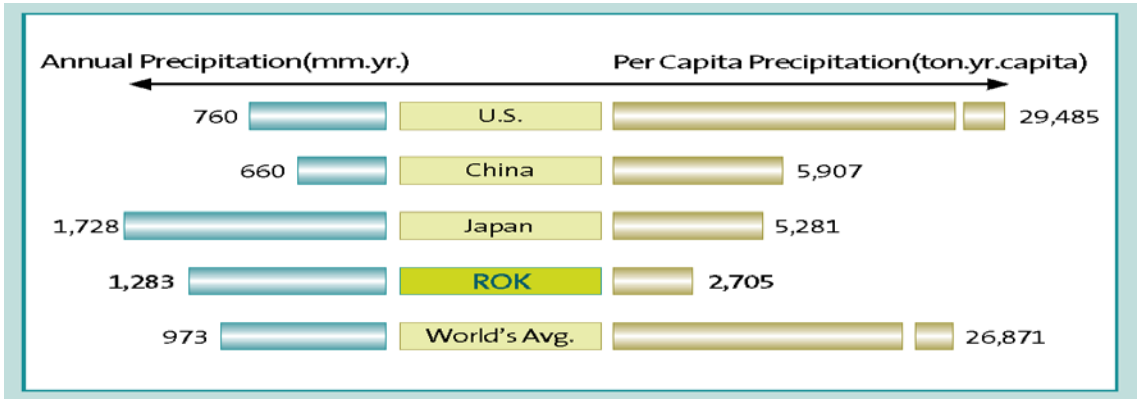


Monthly variation of rainfall

Regional variation of rainfall

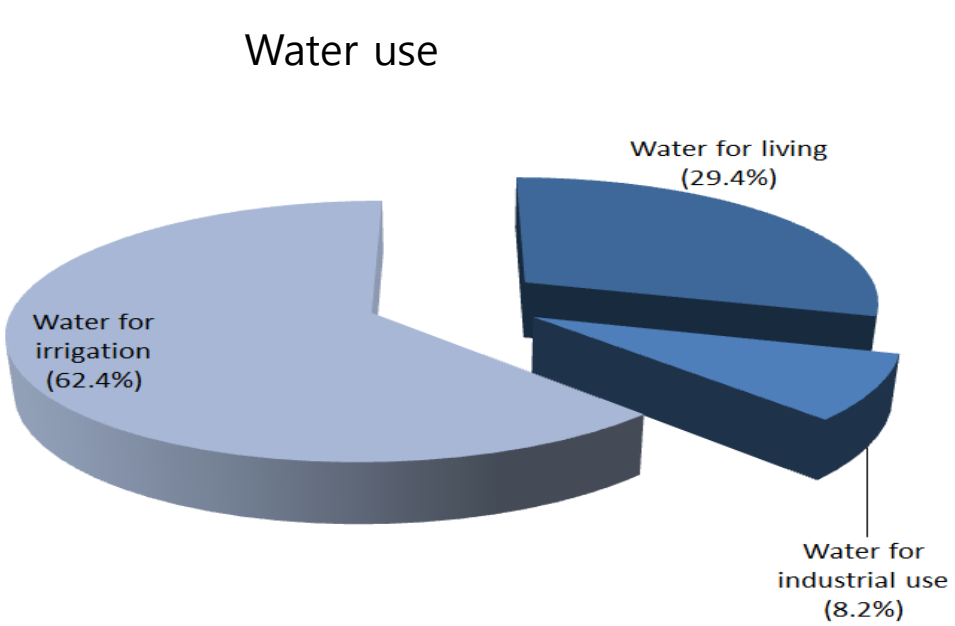


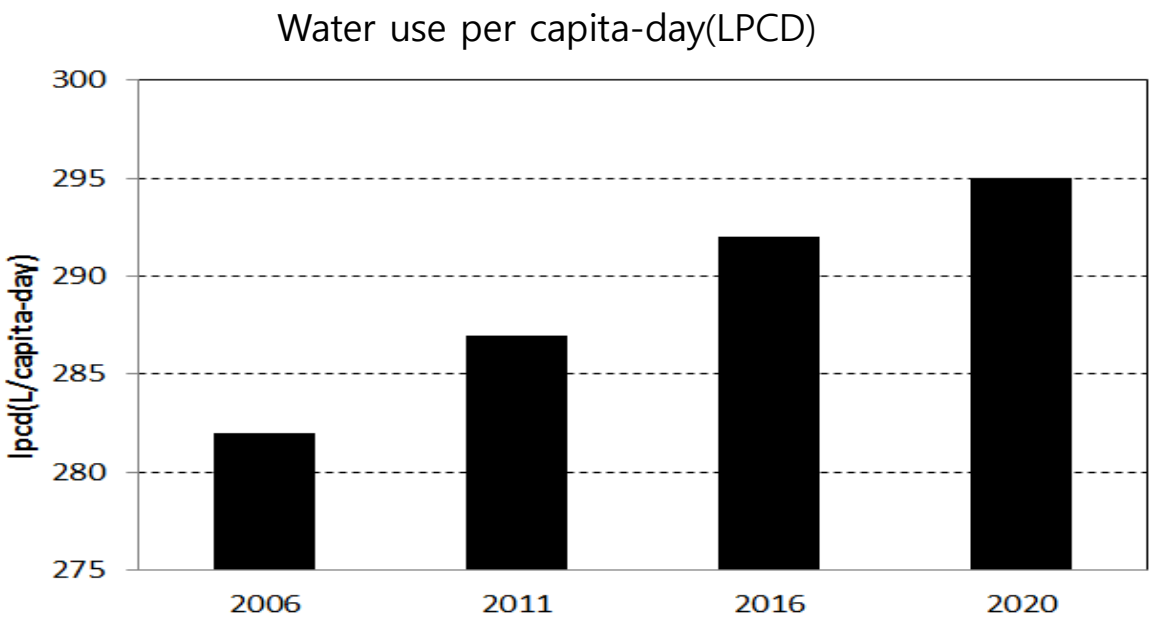
【주】 자료기간은 최근 30년 평균('78~'07년)



Korea Meteorological Agency (http://www.kma.go.kr)

Water use





Ministry of Environment (2014), Master plan of water reuse (2011~2020)
Ministry of Environment (2014), Statistics of sewerage

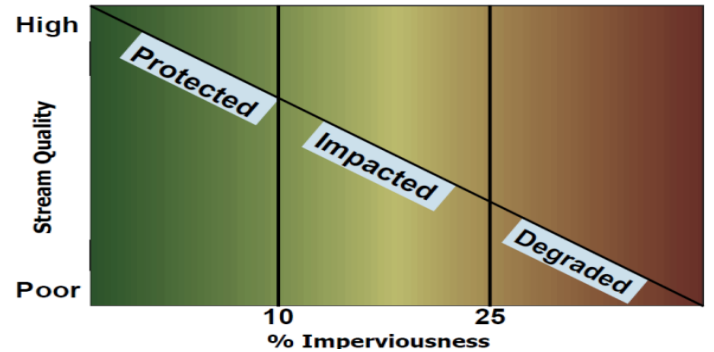
- Water is not a sufficient resource in Korea because of high population density, small national territory with steep slope, seasonal variation of rainfall, high use of irrigation water, ecological waters, etc. → We needs more water sources

Impact of urbanization

- **Conventional urban development:** reduce green spaces / change natural water circulation system by increasing pavement / Increase air temperature by energy consumption

Impact

- Flooding
- Drought
- Air and water pollution
- Heat problems
- Sink hole



- **New urban development:** increase green spaces → needs more waters for watering of gardens and plants / decreases the groundwater table

Solution: water-wise cities

(for Ecosystem Services of Supporting, Provisioning, Cultural, Regulating services)

Changes of urban environment

(Conventional development)

(New development)

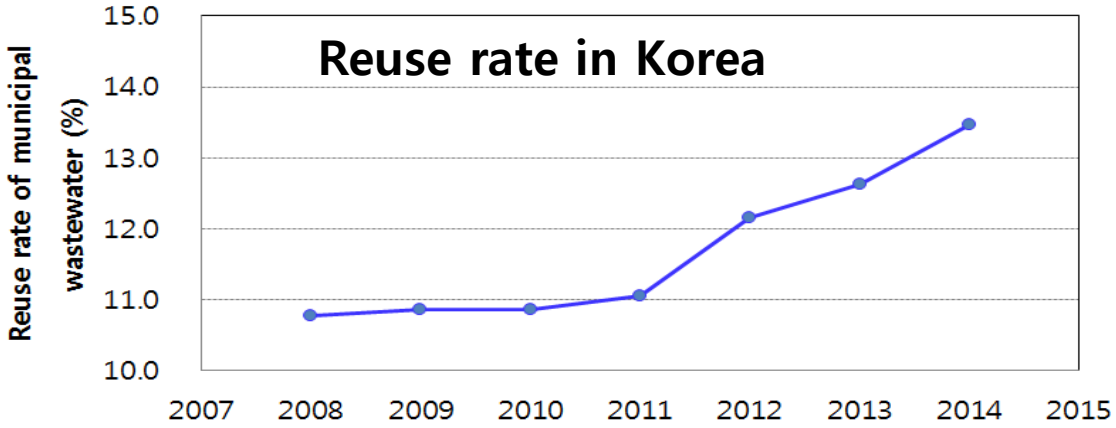
Reuse is important in urbanized area.

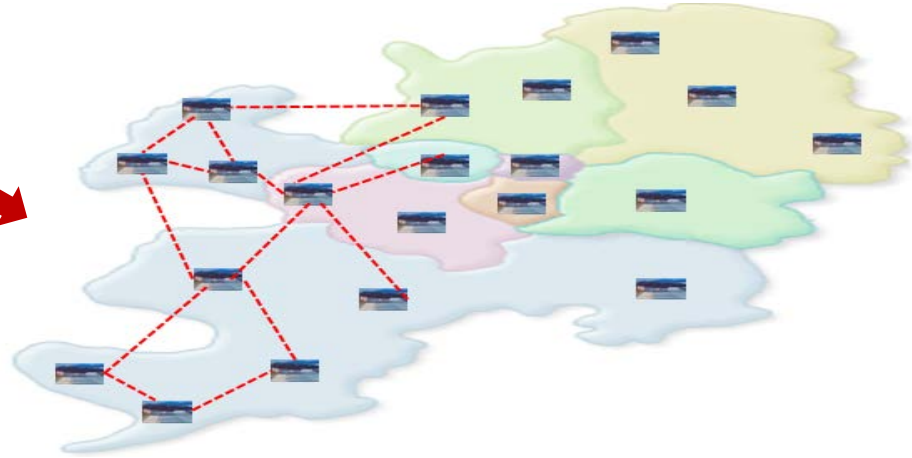
- New urban design needs more waters for ecological use(watering for landscaping, fountain waters, cleaning waters, stream waters for ecological use, etc) .
- No enough waters in urban areas except the portable water.

New water resources: Reuse and Rainfall

WWTPs (The meaning of term of effluent should be changed from *discharged* to *PRODUCED → water resources*)

River waterbody

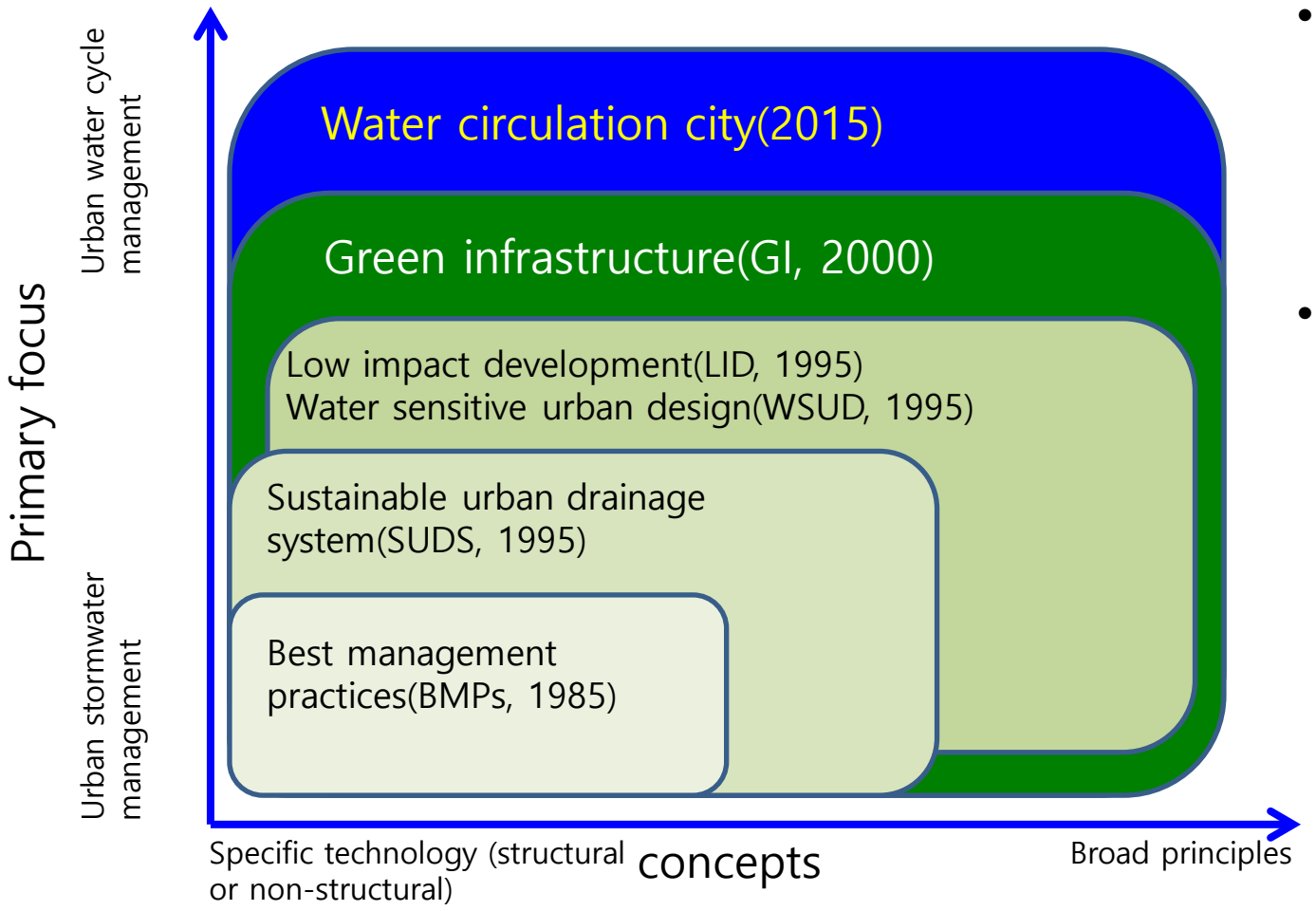




- Water is needed in urban areas, not in downstream.
- However, it is very difficult to reuse of treated effluent waters from WWTPs because it is located in the most downstream.

- **For Reuse → Decentralized WWTPs for wastewaters**
- **For Rainfall → LID(Low Impact Development) implementation with high infiltration, retention and evapotranspiration of rainfall**

Progress of urban water management

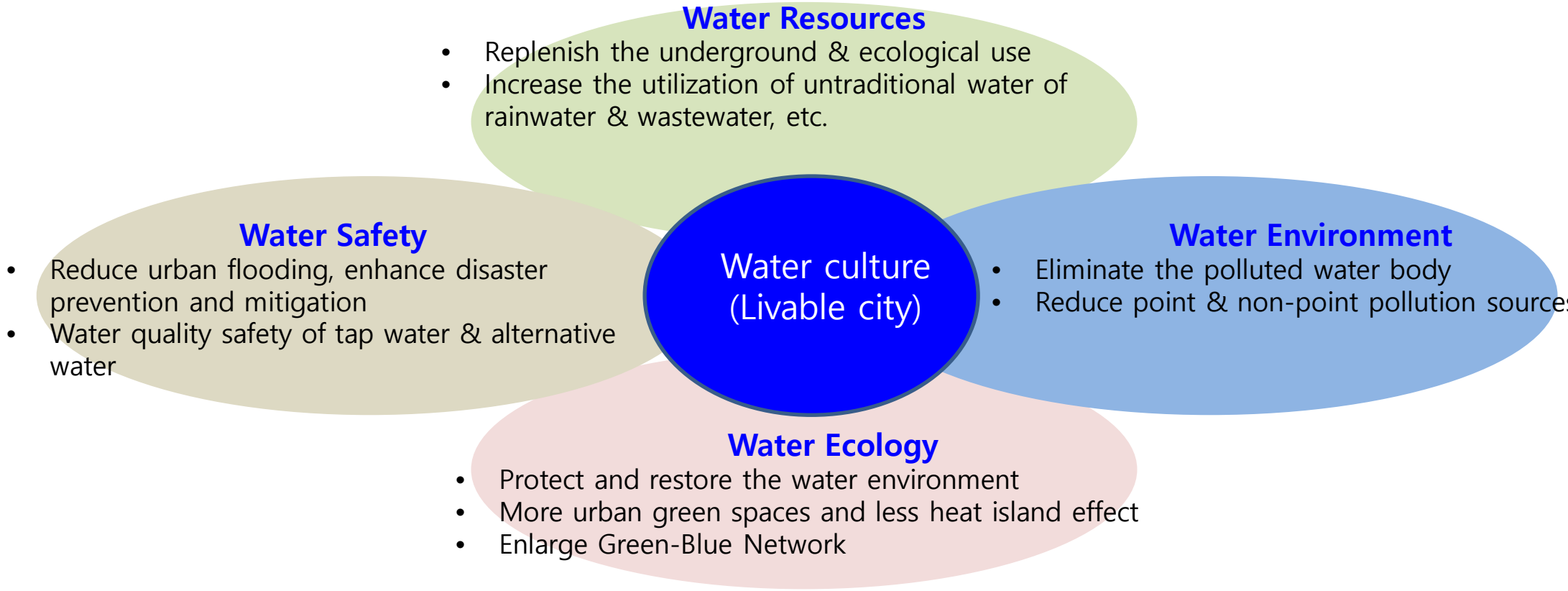


- **Low impact development (LID)**
  - Describes a land planning and engineering design approach to manage stormwater runoff
  - Emphasizes conservation and use of on-site natural features to protect water quality

- **Green infrastructure (GI)**
  - A network providing the components for solving urban and climatic challenges by building with nature.
  - Main components include stormwater management, climate adaptation, less heat stress, more biodiversity, food production, better air quality, sustainable energy production, clean water and healthy soils, and so on.

Referred from Fletcher et al. (Urban Water Journal, 2014, 12(7))

Main components of water-wise cities in Korea

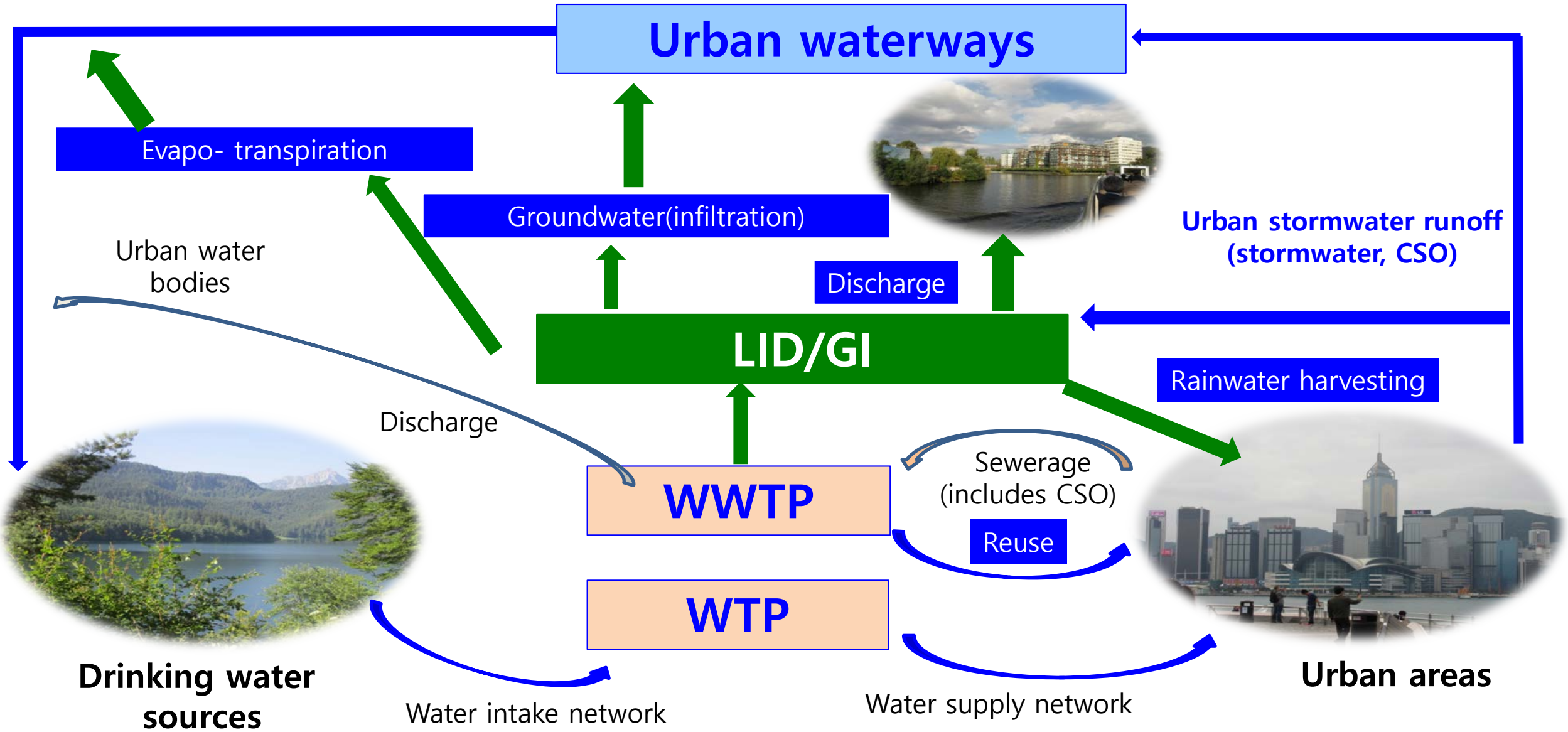


Nature
- Learn, follow, utilize, and protect the nature

Cycling
- Water sources, energy recovery, resource recovery, and nutrient cycling.

Function
- Ecology, purification, landscape, and flood drainage

Water management in water-wise cities



Water circulation cities(water-wise cities) in Korea

- Seoul City: LID Ordinance (2014)
- Suwon City: Green infrastructure(GI) Application (2014)
- Pyeongtaek City: Establishment of LID plants for Godeok New City
- Cheonan-Asan City: LID Application (2015)
- Sejong City: LID Planning in Progress

- **Demonstration Project for Zero Urban Runoff (2014~2015): Ochang, Cheongju (26 ha), Jeonju Overseas District (31ha)**

Leading Water Circulation Cities: Gwangju, Daejeon, Gimhae, Ulsan, Andong (2016)

Conclusion

- Goal of sustainable ecosystem services: manage water in the city → **Water wise city**
- Approach for water wise city: **Water-Energy-Food nexus**
- **Technological approaches for water wise cities**
  - Decentralized wastewater treatment plants
  - Low Impact Development (LID) and Green Infrastructure (GI)
  - Rainwater harvesting
  - Energy harvesting
  - Urban agricultural harvesting
  - Wastewater reuse
  - Groundwater recharge
  - Sky garden
  - Resource regeneration, etc

Water – Energy – Food in Ecosystem Services

Energy crisis in California in 2000

Food crisis in Ireland between 1845-1852

Water crisis in Korea in 2017

- **Diversification** the implementation techniques
- **Decentralization** of the facilities
- **Integration** of the management

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Sharing Water

Organization

WORLD WATER COUNCIL

GOVERNO DE BRASÍLIA

MINISTRY OF THE ENVIRONMENT

BRASIL BRAZILIAN GOVERNMENT

Support

ABDIB

Adasa
Agência Reguladora de Águas, Energia e Saneamento Básico do Distrito Federal

ANA
AGÊNCIA NACIONAL DE ÁGUAS