



UNIVERSIDAD NACIONAL DE COLOMBIA



SIREH  
GRUPO DE INVESTIGACIÓN EN INGENIERÍA DE RECURSOS HÍDRICOS  
WATER RESOURCES ENGINEERING RESEARCH GROUP

# Assessing the potentiality of rainwater harvesting systems in Bogotá

Edgar Villarreal, PhD  
Department of Civil and Agricultural Engineering  
Lyon, 2017



INSA  
INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON



UNIVERSITÉ DE LYON



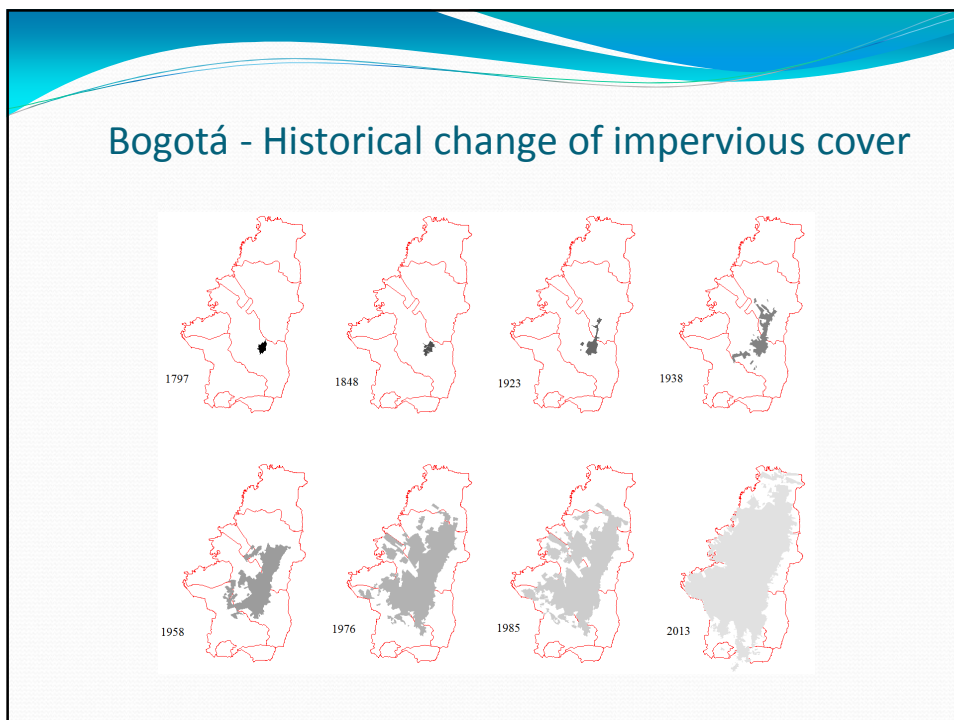
deep



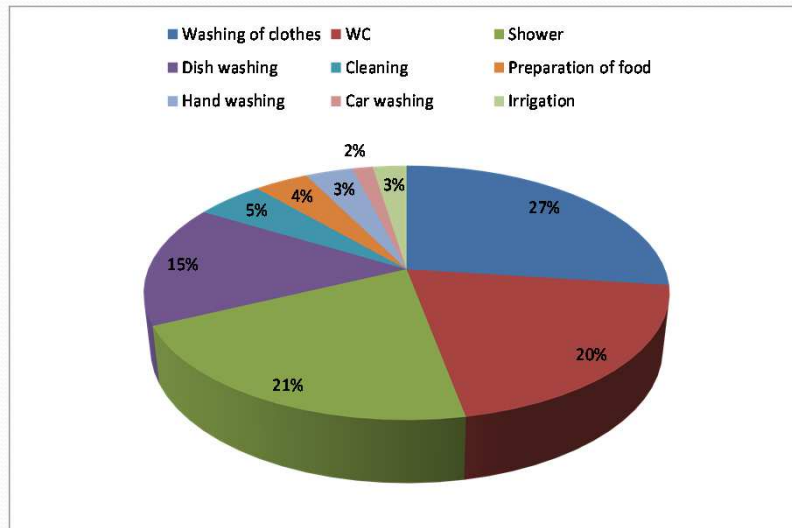
Pontificia Universidad JAVERIANA

## Topics

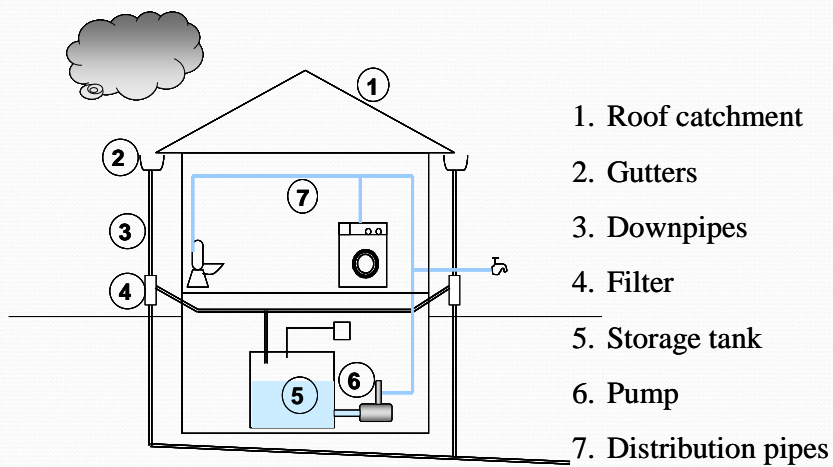
- Urbanisation and problems related to traditional SW management
- Rainwater tanks: a way to handle urban stormwater
- Previous research
- Presentation of case studies
- Future developments



## The use of water in Colombian households



## Rainwater collection systems



### Previous research (undergrad thesis, 2004)

- Approximately 50% of Colombia's population live in urban areas
- A theoretical investigation was carried out: apartment buildings and single family houses were considered
- A preliminary design: based on Villarreal-Dixon → tank capacity
- It is feasible to implement these systems

### Rainwater quality (master thesis, 2011)

- Roof runoff characterization: three buildings in the campus (roof material, area, location)
- Several precipitation events (intensity and duration, total precipitation, dry periods → first flush)

## Assessing the potentiality of rainwater harvesting systems in Bogotá - Case studies

- Investigate rainwater collection systems:  
Use rainwater for domestic uses that do not require high-quality treated water (water conservation: WSE)

Rainwater tanks as elements of urban stormwater management systems

Rainwater quality

## School of Engineering Building – Universidad Nacional de Colombia



## Building School of Engineering – Universidad Nacional de Colombia

- Built in 1941 - 1942 (roof area: 1800 m<sup>2</sup>)
- Refurbished between 2012 - 2015
- A rainwater collection system was implemented (capacity of the tank: 18 m<sup>3</sup>)
- Rainwater is used for urinals and toilet-flushing
- Research grant: continuous automatic flow measurements

## Alkosto department stores



## Alkosto - Venecia

- Built in early 2000s (roof area: 6000 m<sup>2</sup>)
- Rainwater collection per year: about 4800 m<sup>3</sup>
- 75% of the total demand is supplied with rainwater

## Inventory of rainwater collection systems in Bogota

### According to the Environmental Authority:

- ✓ A total of 13 systems have been constructed between 2012 and 2017
- ✓ Reported rainwater use: between 30 – 75% (?)
- ✓ Reported drinking water savings: 12 – 50% (?)
- ✓ Roof areas and capacity of the tanks: unknown

## Future developments

- Long-term follow-up of the systems
- Investigate rainwater use in industrial processes
- Rainwater quality characterization, both in Bogotá and other colombian cities

## Future developments

- Investigate the performance of rainwater tanks as elements of SUDS
- Costs: implementation, payback
- (People's acceptance)
- Development of guides for the design, implementation and operation of these systems in Colombian urban environments